THE IRON TRADE REVIEW

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Buying Unchecked by High Prices

Mills Have Difficulty in Satisfying Customers—Numerous Advances in Pig Iron and Finished Materials

ADVANCES in prices of finished steel have been coming rapidly, but they have had little effect in checking buying. At the same time, the scarcity of billets and other forms of semi-finished material has become more serious and large consumers of steel are already predicting that they will be compelled to close their plants at least temporarily, if present conditions continue. An eastern car builder fears enforced idleness of some of his plants in the second quarter of next year and one eastern ship yard has already been delayed on some work by slow delivery of plates from eastern mills. Many mills are actually fighting off business and are having trouble in keeping up with their contract requirements.

The only noteworthy instance of curtailed buying due to high prices is found in the decision of the Pennsylvania system not to buy the 11,000 freight cars for which it has been inquiring, owing to the high prices quoted by car builders which were based on lower prices for steel than those now prevailing.

Prices

Advances in the prices of finished materials include nuts and bolts 10 per cent, rivets $4, spikes $3, shafting from $3 to $5, track bolts, $3, and cut nails $3. Heavy melting steel is considerably higher. Warehouse prices in shapes and plates have been advanced $2 and on bars $4 at Pittsburgh and warehouses throughout the country are doing an extremely heavy business.

Iron Ore

Ore shippers are bringing the season of 1915 rapidly to a close, although heavy weather and low water have caused some delays during the past week. Some of the shippers are loading their last cargoes this week and the tonnage to be moved in December will be small. A cargo of ore was covered a few days ago at $1.40, net, or $1 above the regular rate, for shipment from an upper lake port. This is the highest rate that has been paid on the lakes since 1899. A recent offer of $1.50 per ton to several vessel owners was not accepted, as hauling grain at recent high rates was more profitable. A number of blast furnaces, including both Tonawanda stacks and the stack of the New York State Steel Co., will remain idle until after the opening of navigation next year on account of not having ore. It is understood that other stacks whose owners were anxious to blow them in have been unable to contract for ore. There is little talk as to ore prices.

Pig Iron

Steel-making pig irons have been in the lead of the buying the past week. A number of round tonnages of basic and a fair tonnage of bessemer figure in the market at Pittsburgh, while in the Philadelphia market about 20,000 tons of basic have been purchased. The price tendency is decidedly upward. The Virginia Iron, Coal & Coke Co. has advanced its schedule 75 cents for this year and 50 cents for the first and second quarter of next year. At Buffalo, the pig iron market is very strong and there is very little iron to be had. The blowing out of several stacks at Buffalo for re-lining will make the production more limited. A soil pipe maker has purchased 10,000 tons of foundry grades for delivery at New York, New Jersey and Maryland plants. The re-sale southern iron, which was being disposed of at about $13, Birmingham, for No. 2, has disappeared and $13.50 is now the minimum quotation.

Scrap

The strength of the scrap market, influenced largely by the heavy buying of steel scrap in the Pittsburgh district by the Steel Corporation at $17, is a feature of the market and scrap is being bought at long distances from Pittsburgh for shipment to that city.

Plates and Shapes

The demand for shapes and plates is very strong. In some cases 2.10c and 2.15c, Pittsburgh, are being obtained for prompt delivery of plates. Contracts include 200 portable bridges for the British government, calling for about 3,000 tons of shapes. The two battleships which Secretary Daniels hopes to build in government yards will require 31,000 tons of steel in addition to armor plate.

THE OPEN HEARTH

Animosity is Evident

DURING the past ten days, a great deal of newspaper notoriety has been given to attacks which have been made by various persons on the Geiger-Jones Co., Canton, O. Owing to these attacks and rumors that the attorney general of Ohio was about to take action against the Canton concern, the latter deemed it necessary to appeal for protection to the United States court which was asked to restrain Attorney General Turner from publishing his opinion concerning the company and Superintendent of Banks Hall from revoking the license of the Canton company. Judge John E. Sater, of the United States district court, declined to restrain the attorney general, but that official very properly decided not to publish his opinion until the case is decided on its merits. The court did, however, restrain the superintendent of banks from revoking the license and at a hearing to be held in Cincinnati, Nov. 27, at which three United States judges will sit, the constitutionality of the so-called Ohio "blue sky law" and the propriety of the precedings against the Canton company will be decided.

We are not fully informed as to the merits of the controversy involving the Canton company. We do know, however, that this company has been connected in a thoroughly creditable manner with the financing of some very important iron and steel and other manufacturing concerns in Ohio and also that charges against the company have been made in a manner which strongly suggests animosity on the part of several newspapers and others. The vicious attacks made on the company indicate the possibility of jealousy and other low motives. However this may be, it is no more than just that judgment be suspended concerning the Canton company until the courts have passed on the merits of the case. It certainly would be most unjust to embarrass in any way any of the high-class companies which have been organized through the efforts of the Geiger-Jones Co.

Need of United Effort

THE annual convention of the National Founders' Association, held in New York last week, was featured by much discussion of one of the vital needs of American industry—namely, the development of some adequate vehicle for the effective expression of the business opinion of the country on legislative, labor and other problems. During the last year or more, there has been a growing dissatisfaction with the present lack of co-ordination in the efforts by which members of the various industries, through their associations, endeavor to protect themselves from dangers which menace them all in equal degree. The time honored mode of action is for representatives of the various industries to convene periodically from various parts of the country and put their respective associations on record on various matters, without, apparently, securing any traceable result. In contrast with this singularly ineffective policy of the associations whose members collectively contribute so large a share of the prosperity of the country, is that of the labor unions, which are organized nationally in order that they may present a united front on all matters having a bearing on what they consider their interests.

One speaker at the convention suggested that the proper function of the business association is to consider problems peculiar to the industry which it represents; all other matters should be submitted to boards representing these associations, each board to be entrusted with a certain question, with full power to present the united demands of industry and commerce as a whole. Some such converging of the efforts of the various industries on all matters of mutual concern undoubtedly will come shortly, since business men generally are coming to realize that it is only the lack of effective co-operation which heretofore has prevented them from securing from the government the recognition they deserve.

Walsh Bobs Up Again

AFTER making a thoroughly discreditable record as chairman of the late unlamented commission on industrial relations, it was hoped that Chairman Walsh would be content to remain in obscurity. But he is not to be kept out of the limelight and he announces that an industrial relations committee has been organized in Washington to carry out the recommendations of the Manly report of the commission. Mr. Walsh claims to have associated with him some labor leaders and some other men who, it seems to us, could be in better business. In fact, we doubt very much whether men of the type of Bishop Williams, of Michigan, referred to as Walsh supporters by him, have assented to the program which Walsh announces.

The central idea of the Walsh program is to promote the efforts of organized labor. The intention is to do it by the adoption of a very radical policy. Mr. Walsh says that while the committee will take no part in the discussion regarding the future size of the army and navy, it will advocate that all munitions and war ships shall be manufactured, as far as possible, in government plants. One thing that he intends to insist upon is that the citizen soldiery when organ-

THE OPEN HEARTH

ized shall never be used against workmen on strike. In other words, if workmen are on strike and engaged in lawlessness, threatening life and property, they shall not be interfered with. This is a preposterous proposition. If the citizen soldiery is to be effective, it must be used against lawlessness and violence at home and abroad.

As the Progressive party has been disintegrating, the courts have been comparatively free from attack, and even Col. Roosevelt has said nothing about the plan to refer court decisions to the people, but now Mr. Walsh comes to the front and says, "We shall endeavor to secure the passage by congress of a statute, or, if necessary, the initiation of a constitution amendment providing specifically that the courts shall exercise only the powers granted by the constitution and shall not be permitted to declare laws unconstitutional." Mr. Walsh knows that it was long ago established, as far back as the days of John Marshall, that the courts have the power to declare laws unconstitutional, but he says that the veto of legislation by the courts serves to shake the confidence of the people in reform by orderly process of law. On the contrary, we believe that confidence of the people in their government has been strengthened greatly by the wise decisions of the courts, including those which have declared numerous acts unconstitutional. We do not believe there is the slightest probability that this power will be taken from the courts.

Mr. Walsh proposes to put upon the already overburdened federal trade commission the prosecution of those engaged in the "exploitation of labor through long hours, low wages, unsafe or unsanitary conditions". He would have this done by special act, which would require everything in the way of unfair treatment of labor unfair competition to be dealt with by the commission.

"We shall," says Mr. Walsh, "resist the repeal of salutary labor legislation, such, for example, as the seamen's bill." Perhaps Mr. Walsh has not heard of the storm of protest which has gone up from seamen who are being thrown out of jobs on account of this new law, enacted ostensibly in the interests of the laboring man.

Mr. Walsh proposes to have the numerous conflicting and supplementary reports of the commission on industrial relations put into type at the expense of the people. He would also publish all the testimony taken. Thus would the nation be enlightened as to the ridiculous conflicts of opinion of the different members of the commission, but the big printing bill would be a waste of public money. The commission has passed out of existence. Let it be forgotten, and let Mr. Walsh be effectually suppressed as soon as possible.

The Right to Work

THE Supreme Court of the United States has given union labor another knock-out blow in the decision in the case arising from the action of the people of Arizona in enacting last November, through the initiative process, a law requiring every employer, either corporate or private, employing more than five persons to have at least four-fifths of them either native born or qualified electors. Fine and imprisonment were the penalties for the violation of the act.

In announcing the decision of the court, Justice Hughes, referring to the fact that the action was brought under the fourteenth amendment to the constitution, said, "It requires no argument to show that the right to work for a living in the common occupations of the community is of the very essence of the personal freedom and opportunity that it was the purpose of the amendment to secure. If this could be refused solely on the ground of race or nationality, the prohibition of the denial to any person of the equal protection of the laws would be a barren form of words".

This is a decision more far-reaching than the immediate result in wiping out the Arizona law. It recalls the fight that was made by unions in New York City to keep foreigners from working on subway and other municipal work in the metropolitan district. The condition which confronted officials in New York was so serious that they did not wait to obtain a court decision, but appealed to the legislature, which speedily amended the law. Attempts to compel employers to employ certain kinds of men and not employ other kinds are doomed to failure. The right of men to work without unfair discrimination and the right of employers to employ whom they please, as long as they do not discriminate unfairly, must be maintained.

The present season, one of the most interesting in the history of the lakes, is winding up in rather comfortable fashion and it will be necessary to move very little ore next month. Disappointment of some shippers who have not succeeded in making desired contracts for vessel tonnage is keen, but they will probably find a way to work out of their difficulties and be more alert next time. It is also likely that their experience will result in new orders for boats as soon as any of the lake yards are ready to take them. At present, however, those who have not made reservations for the building of vessels stand a very slim chancce of obtaining delivery before Jan. 1, 1917.

Prices Present and Past

Quotations on leading products November 24, average for October, 1915, average for August, 1915, and average for November, 1914. Prices are those ruling in the largest percentage of sales at the dates named.

	Prices Nov. 24, 1915.	Aver. for Oct., 1915.	Average for Aug., 1915.	Aver. for Nov., 1914.
Bessemer pig iron, Pittsburgh..	$17.95	$16.95	$15.89	$14.70
Basic pig iron, Pittsburgh.....	16.95	15.95	14.89	13.45
No. 2 Fdy. pig iron, Pittsburgh	17.45	15.57	14.70	13.70
Northern No. 2 Fdy., Chgo....	17.50	14.44	13.38	13.00
Lake Superior Charcoal, Chgo..	17.25	16.25	15.75	15.75
Mall., Bess., Chgo.....	17.50	15.12	13.38	13.00
Southern No. 2, Birmingham...	13.50	11.87	11.25	9.88
Southern Ohio No. 2, Ironton..	16.50	14.88	14.25	12.63
Basic, eastern Pa.....	17.75	17.50	15.25	13.50
No. 2X Virginia furnace.....	15.50	13.75	12.75	12.50
No. 2X foundry, Philadelphia...	17.75	16.25	15.00	14.25
Ferro mang., Balti., (prompt)..	100..00	105.00	100.00	68.00
Bessemer billets, Pbgh.....	28.00	25.50	23.00	19.00
Bess. sheet bars, Pbgh.....	30.00	25.50	24.00	19.50
Op.-h'th sh. bars, Pbgh.....	30.00	26.50	25.00	19.50
Open-hearth billets, Pbgh.....	28.00	26.50	24.00	19.00
Steel bars, Chgo.....	1.89	1.59	1.49	1.25
Steel bars, Pittsburgh.....	1.80	1.41	1.30	1.10
Iron bars, Philadelphia.....	1.759	1.55	1.40	1.15
Iron bars, Cleveland, local del'y.	1.50	1.39	1.22	1.20

	Prices Nov. 24, 1915.	Aver. for Oct., 1915.	Average for Aug., 1915.	Aver. for Nov., 1914.
Iron bars, Chgo. mill.....	$1.60	$1.37	$1.23	$0.98
Beams, Chgo.	1.89	1.59	1.49	1.25
Beams, Pittsburgh	1.75	1.41	1.30	1.10
Beams, Philadelphia	1.859	1.559	1.459	1.25
Tank plates, Pittsburgh.....	1.75	1.42	1.30	1.07
Tank plates, Chicago.....	1.89	1.55	1.44	1.25
Tank plates, Philadelphia.....	1.859	1.559	1.459	1.25
Sheets, blk., No. 28, Pbgh.....	2.40	2.05	1.83	1.85
Sheets, blue an., No. 10, Pbgh.	2.00	1.60	1.36	1.35
Sh., galv., No. 28, Pbgh.....	4.30	3.50	3.93	2.85
Wire nails, Pittsburgh.....	1.90	1.76	1.61	1.55
Connellsville fur. coke, contr...	2.35	2.25	1.75	1.69
Connellsville fdy. coke, contr...	3.00	2.48	2.25	2.25
Heavy melting steel, Pbgh.....	16.50	14.00	13.38	10.30
Heavy melting steel, east'n Pa.	14.75	14.50	13.50	9.50
Heavy melting steel, Chgo.....	14.50	11.56	11.50	8.25
No. 1 wrought eastern Pa.....	17.00	16.00	14.50	11.50
No. 1 wrought, Chgo.....	13.75	10.68	10.12	7.50
Rerolling rails, Chgo.....	15.00	13.25	11.75	9.50
Car wheels, Chgo.....	14.00	11.75	11.38	10.00

(For Additional Prices See Page 1060.)

Steel Making Pig Iron Leads

Renewed Activity at Pittsburgh and Philadelphia—Resale Southern Iron Disappears and Alabama Prices Are Higher

Pittsburgh, Nov. 23.—Heavy buying of pig iron again characterizes the Greater Pittsburgh market, after a brief lull. The Republic Iron & Steel Co. has taken 15,000 tons of bessemer iron from one seller and 9,400 tons of the same grade from another dealer, at about $17.42, delivered, or $17, furnace, for shipment the first quarter of next year. The Marshall Foundry Co., Pittsburgh, is negotiating for from 10,000 to 20,000 tons of bessemer iron for second and third quarter delivery. The N. & G. Taylor Co. wants 5,000 tons of basic iron for shipment the last half of 1916 to Cumberland, Md. The American Iron & Steel Mfg. Co., Lebanon, Pa., which opened negotiations for 10,000 tons of basic iron, is understood to have closed for some of the iron involved. Basic pig iron has sold at as high as $16.25, valley, for eastern shipment; some sellers are asking $16.50, valley, and above. Bessemer iron is being held at $18, valley, by some dealers, but no tonnage has been sold at that figure, so far as known.

Brokers are inquiring for several round tonnages of steel-making iron, including 10,000 tons of basic iron for first quarter shipment in the east; 5,000 tons of the same grade for nearby delivery and 10,000 tons of basic and 10,000 tons of bessemer for first quarter delivery. Foundry and malleable iron are commanding $16, valley, and above.

Chicago Demand Brisk

Chicago, Nov. 23.—Inquiry for foundry and malleable pig iron continues active and sales are being booked at $17.50, Chicago furnace, with regularity. Occasional tonnages are taken at a higher schedule, but usually some other consideration enters into the deal. Sales for November promise to be about equal to those of September, both months being less than the bookings made during October, which was an unusually active month.

Lake Superior charcoal iron has been advanced $1 per ton and the schedule now calls for $18.75, delivered, Chicago, for Nos. 2, 3, 4 and 5, and $19.75, delivered, Chicago, for Scotch grades. Charcoal iron makers have booked large tonnages and have comparatively little iron remaining for delivery to July 1.

Southern iron is held by most sellers at $14, Birmingham, with one interest willing to take additional tonnage at $13.50 for December delivery and $14, Birmingham, for next year. Some resale iron which has been held for speculation appears on the market from time to time and occasionally is sold at $13, Birmingham, but it is believed this iron is now nearly exhausted. Its presence has not affected furnace schedules.

Jackson county silveries are being held high and most stacks are well sold up and are now out of the market. The prevailing price for 8 per cent silicon is $23 to $24, furnace.

Basic the Leader

Philadelphia, Nov. 22.—Basic again led in the week's turnover in a continued strong but somewhat less active iron market in this territory the past week. Sales of basic totaled about 20,000 tons. The American Iron & Steel Mfg. Co., Lebanon, Pa., took 10,000 tons and the Phoenix Iron Works 7,500 tons, both for first quarter, at a price around $17.75, delivered. Most makers quoted $18, delivered, or over. The seller was an eastern Pennsylvania maker who had not been active in the market recently. The market now seems stronger and it is doubtful whether $18, delivered, could be shaded. One maker wants $19, delivered. A sale of 1,000 tons

(*For complete prices see page* 1060.)

for first quarter was made at $18.50, delivered, the highest price yet. All eastern makers of low phosphorus have little or no iron left for first half. Standard makers and one Lebanon maker are quoting $30, furnace, and a second Lebanon furnace several dollars less. Sales of the week were not heavy, but Canadian buyers took about 3,000 tons additional of standard from an eastern maker at $29, furnace. The Worth Bros. Co., Coatesville, are about to make up a tonnage of this grade for Midvale Steel Co. needs. Eastern Pennsylvania foundry grades continue to advance. Two Lehigh valley makers have gone to $17, furnace, for No. 2X for this year and to $17.50 for first quarter. Some makers are above this schedule and are making sales. The Philadelphia market is up to $17.75 to $18.25 subject to a little shading in one quarter. Standard forge has been sold at $17, delivered, and higher. The Reading Iron Co., due to trouble with one furnace, recently inquired for 5,000 to 10,000 tons, but has bought only a part of this amount and has withdrawn the remainder. Virginia iron continues very strong and there are only few sellers, because several furnaces are heavily booked and one is piling iron awaiting higher prices. Very little No. 2X is offered and this grade has shown considerable spread. Some recent sales were made at $15, furnace, while one maker now is quoting $16.50, furnace. The Virginia Iron, Coal & Coke Co. again has advanced 75 cents for this year and 50 cents for first and second quarter, placing, for the year and first quarter, No. 2 plain at $15.25, No. 3 at $15, No. 4 and forge at $14.75, and for second quarter 25 cents higher. One Virginia maker began the month with 60,000 tons of oders, a considerable portion of which was booked in New England.

Very Strong Conditions

New York, Nov. 23.—A very strong market exists in pig iron in this district. While there is no general buying, consumers freely are paying the higher prices asked by makers wherever they are in need of metal. In some cases, increased purchases are being made as an insurance against possible shortages later, but there is no evidence that consumers are being excited into buying metal greatly in excess of their established needs. Shading of prices is extremely limited. Advances are continuing in all directions. At Buffalo, there now is talk of $20, malleable and basic, and one maker, in fact, is quoting that figure for malleable and No. 2X foundry. Another Buffalo interest has gone to $18, furnace, on malleable, but will take only a limited amount of business. Foundry iron now is held by leading sellers at $17.50 to $18, furnace, for No. 2X. The Buffalo situation is being further strengthened by the enforced blowing out of several stacks for relining. Lake Superior charcoal is up to $18.84, Buffalo, for No. 2. Eastern Pennsylvania makers who have been below $17, furnace, for No. 2X, now have advanced to that figure for this year and some are quoting $17.50 for first quarter. A soil pipe maker has purchased about 10,000 tons of No. 2X, No. 2 plain and No. 3 for first half shipment to Newark, N. J., Medina, N. Y., and Baltimore, the business going to eastern Pennsylvania, Buffalo and southern makers. This is the week's largest transaction. While other sales have been numerous, they usually have been small individually. An Elizabeth, N. J. buyer, asking 2,500 tons of foundry, has closed.

Ocean freight rates are going to unheard-of points, and from 90 cents to $1 per 100 pounds now is being quoted to Italy. Export sales, consequently, are not numerous. An eastern Pennsylvania maker sold 600 tons of bessemer to Italy at $18, furnace net, without commission. A Buffalo maker booked 1,500 tons of foundry to Italy and will ship by New Orleans. Italy has offered to buy a lot of 5,000 tons of bessemer.

Iron at $20 in Sight

Buffalo, Nov. 23.—The sold up condition of the furnaces, the scarcity of the grades of iron in demand and the extent of the inquiry for material on the part of the consumers is causing prices to advance steadily and it is predicted by some of the interests in the district that a $20 minimum will be reached in a short time. Furnacemen say the situation is tightening up to an almost unprecedented degree. With the changes in prices that have gone into effect, $17 is now the positive minimum.

Iron for delivery over the remainder of the year and for the first and second quarters of 1916 is becoming scarce. The producing interests of the Buffalo district, for the most part, are sold up to such an extent that selling agencies are not permitted to book orders for special grades without submitting inquiries to the home offices, and this situation is also true with reference to round tonnages of the regular grades. The furnaces are passing on the matter of deliveries which now have to be considered as much a part of contracts as the matter of prices. The range for the immediate market is from $17 to $20, covering the minimum on even the low grades to the present quotations on the high silicon irons. Very little of the latter is now obtainable in the district at any price. Stocks of special grades of charcoal iron have been exhausted, it is reported.

(*For complete prices see page* 1060.)

Another Advance

Cleveland, Nov. 23.—The Cleveland price for No. 2 foundry and malleable has again been advanced 50 cents and is now $17, furnace, or $17.30, delivered in the city. A small tonnage has been sold at the new figure. There is very little activity in the market at the present time. Reports from the valley indicate greater strength and some sales have been made at $17, valley furnace, for No. 2 foundry. Of a recent purchase of 15,000 tons of bessemer by the Republic Iron & Steel Co., 12,000 tons will be furnished by one maker and 3,000 tons by another, at about $17, valley furnace. Fannie furnace of M. A. Hanna & Co. was blown in last Saturday.

Southern Iron Higher

Cincinnati, Nov. 23.—Southern resale iron that had been holding the market at $13, Birmingham basis, for No. 2 foundry, disappeared the first of this week, and now $13.50 is the minimum quotation for either prompt or first quarter delivery. A number of furnaces are holding strong at $14 for any delivery through the first half, and from all appearances this will be the general price in a few days. Southern Ohio No. 2 foundry is stationary at $16.50, Ironton basis, for prompt or first half shipment. Silvery iron has again advanced and is now given at from $23 to $24, furnace, for 8 per cent silicon. Bessemer ferro-silicon is $1 a ton better than last week, being now from $26 to $26.50, furnace, for from 10 to 11 per cent. General inquiry is very light, and although sales last week and the first of this week have been good, they have been secured mostly by salesmen from regular customers.

Heavy Inquiry

Youngstown, O., Nov. 23.—Many pig iron consumers now are coming into the market to cover their requirements for the first half of next year. Domestic inquiry for all grades aggregates a heavy tonnage and some big inquiries for bessemer pig iron for export are in the market. Gray forge is an exception, continuing in light demand. Malleable iron users are showing more active interests. Pig iron prices are strengthening steadily. A sale of bessemer pig iron

at $18, valley, is reported at Pittsburgh yesterday. Malleable and No. 2 foundry have been sold at $17, valley, and $16.25 is asked by some sellers for gray forge. Valley sellers are quoting No. 2 foundry $16.50 to $17, valley; malleable, $17; gray forge, $15.75 to $16.25. One valley interest is holding its remaining stock of bessemer for $20, valley.

Near End of Ore Shipping

Some Shippers May Not Be Able to Move All Their Ore Next Season—Little Talk About Prices

Cleveland, Nov. 23.—Some reservations have been made by selling agencies for companies with which they are affiliated and there have also been some reservations for consumers not connected with selling agencies, but consumers have not shown the anxiety that might be expected in regard to their ore supplies for next year. Very little is being said about prices and ore men hope that sentiment will not crystalize before Jan. 1. There is opposition among ore men to an advance of $1. Oglebay, Norton & Co. have finished their shipments for this year. The Steel Corporation has nearly finished loading and other important shippers will have only moderate tonnages to move before the close of the season. It now seems probable that the ore movement for December will be very light.

The activity of two or three shippers in tying up vessel tonnages for the movement of ore next year came as a distinct surprise to other shippers who did not hesitate to express their indignation that the vessel men were willing to make contracts and ignore some shippers who had given them business in past years. There is danger of some shippers not having encugh vessel capacity to move the ore which they expect to sell for next year. These men say that they will have their own boats in future years, but they cannot place contracts for boats for delivery in time for next season, as lake ship builders are not able to take on any more vessel orders. It is thought that ship building plans have not been fully disclosed, but the prospect of anyone who has not made reservations being able to have a new boat delivered before Jan. 1, 1917, is very poor.

Deals in Foreign Ore

New York, Nov. 23.—Three cargoes or about 15,000 tons of Lucainena Spanish low phosphorus iron ore have been sold to the Worth Bros. Co. at a reported price of 10½ cents per unit at tidewater. The buyer is planning to make up a tonnage of low phosphorus pig iron for the requirements of the Midvale Steel & Ordnance Co., of which it is a part. Three cargoes of Tafna, Algerian, bessemer ore recently were sold to an eastern Pennsylvania furnace at 7½ cents per unit at tidewater and some of this mineral now has arrived. This price is regarded as a favorable one for the buyer for first class trans-atlantic ore and it is probable that eastern furnaces would be interested in a considerable tonnage around this figure. The freight rate on this Algerian ore was 11s 6d. Eastern furnaces, generally, are well protected on their ore supplies at present and it requires attractive prices to stir their interest.

Spot Coke Soft

Thanksgiving Holiday Will Reduce Output —Labor Shortage

Pittsburgh, Nov. 23.—Spot Connellsville furnace coke has been sold at $2.10, ovens, or 65 cents a ton below the figure established several weeks ago. The observance of the Thanksgiving holiday probably will affect production of coke this week and, as a consequence, spot fuel may be scarce and higher in price. The Youngstown Sheet & Tube Co. has covered first quarter requirements and Corrigan, McKinney & Co. are reported to have closed for next year's needs. The contract market shows no change in position. Foundry coke is selling at a spread from $3 to $3.50, ovens. The *Connellsville Courier*, for the week ending Nov. 13, says production was 427,381 tons, an increase of 3,219 tons over the week before. Coke oven operators are handicapped somewhat by a shortage of labor.

Output Increases

Cincinnati, Nov. 23.—The output of coke in southern fields increased a little last week, despite labor shortage. Furnace coke is scarce, and dealers are being urged by furnaces to rush shipments on old contracts, as the latter do not care to close for fill-in orders at the high prices that prevail today. Foundries are taking good shipments on yearly contracts, and have shown a steady increase in melt each month since last August. Wise county and Pocahontas furnace grades range from $2.75 to $3, ovens, and foundry grades from the same districts are quoted at from $3 to $3.50, ovens. New River prices are about 50 cents a ton above those that prevail in the Pocahontas and Wise county districts.

(*For complete prices see page* 1060.)

Cast Iron Pipe

Chicago Comes Into the Market for 19,000 Tons

Chicago, Nov. 23.—Inquiry by the city of Chicago for 19,000 tons of 4-inch to 48-inch cast iron pipe is the only feature of the western market. Bids will be taken Nov. 30 on 11,325 tons of 12-inch to 48-inch pipe and Dec. 1 on 7,500 tons of 4-inch to 12-inch pipe.

Large cities of the west, aside from Chicago, have not yet made up their schedules for next year's activity, but are expected to enter the market shortly and considerable business is looked forward to during December. Occasional instances have been met where the present high price of pipe will result in extensions being put over until the following year in the hope that prices will recede.

Higher Prices Paid

New York, Nov. 23.—Some buying of cast iron pipe is being done by gas and water companies in this district for spring delivery and advanced prices are being paid in these cases, but apart from a limited number of such transactions, the market is quiet and rather uneventful. The Brooklyn Union Gas Co. has been a buyer of about 3,800 tons of 4 to 30-inch from eastern shops for spring delivery. The United States Cast Iron Pipe & Foundry Co. has taken 1,500 to 1,800 tons of 6-inch and larger for a gas company in St. Paul. Several export propositions continue in the market here for Porto Rico, Brazil and other southern countries, but none of these has come to a head.

Tubes Are Quiet

Pittsburgh, Nov. 23.—While demand for tubular goods has improved steadily the last few weeks, yet pipe mills are not as busy as plants engaged in the manufacture of other lines in the Greater Pittsburgh district. Seamless tube and boiler tube makers are enjoying unusual activity and demand for merchant pipe is fairly heavy. The market for oil country goods, however, shows no snap; no large orders have been placed.

Galvanized Sheet Prices

Are Again Very High—Feared That This Branch of the Sheet Business Will Be Permanently Injured

Youngstown, O., Nov. 23.—Increasing scarcity of steel, rapidly climbing spelter prices and shortage of sulphuric acid, together with record-breaking demand for black and blue annealed sheets have combined to bring about an extremely irregular market for steel sheets. Circumstances largely seem to govern sales and a multitude of quotations are in evidence. The lowest price reported quoted in the valleys for black sheets today, for prompt delivery, was 2.40c; for first quarter, 2.50c, Pittsburgh. On the other hand, some sellers are asking as high as 2.75c, Pittsburgh, for prompt delivery, and report sales at that level of good-sized tonnages, regular specifications. One seller reports a sale of over 1,000 tons of black and blue annealed sheets at 2.75c for the black and 2.25c, Pittsburgh, for the blue annealed. This same seller reports a sale of black for first quarter delivery at 3c. The minimum price on blue annealed heard today is 2.10c, Pittsburgh.

Some galvanized sheet makers are asking from 5c to 5.40c. In some cases, sellers have done away with the regular differentials and are basing prices for each gage on its cost. Firm sales of galvanized sheets for prompt delivery are reported at 5.25c. The return of these abnormally high prices has put a damper on demand, which only recently showed signs of reviving. Some makers fear this influence may have a permanent evil effect upon the galvanized sheet market.

Several substitutes for roofing have been distributed among the farmers. Large sales have been made of black sheets covered with an asbestos preparation. These and other kinds of prepared roofing have been given an opportunity to compete with galvanized sheets from a price standpoint, something which they could not do when spelter was around normal levels.

Export demand for all descriptions of sheets continues immense, while many domestic consumers, who held off from purchasing recently because of the advanced prices, now are being forced to cover at still higher levels. The acid and spelter situations have tended to cut down average sheet mill operations, and some mills are refusing to quote on galvanized sheets at all. Black sheets are quoted 2.40c to 2.75c, Pittsburgh; blue annealed, 2.10c to 2.25c; galvanized, 4.50c to 5.25c.

Sheet Prices Soar

Pittsburgh, Nov. 23.—All grades of steel sheets have registered price advances this week. Most makers of galvanized products have withdrawn from the market, as a result of the abnormal spelter situation. No. 28 gage galvanized sheets have sold at a range from 4.30c to 4.50c this week, but the bulk of the tonnage has commanded the latter figure. No. 28 gage black sheets are commanding from 2.40c to 2.50c and No. 10 gage blue annealed sheets are selling at a spread from 2c to 2.10c. Insistent demand for black and blue annealed sheet products continues to feature the situation. Deliveries are deferred several weeks, and it is not unlikely that sharp advances will be recorded before the end of the month.

Sheet Prices Boosted

Chicago, Nov. 23.—Steel sheets, both plain and galvanized, are selling at considerably higher prices than a week ago. No. 28 gage black is now quoted at 2.54c to 2.69c, Chicago, and No. 28 gage galvanized at 4.69c to 5.44c, Chicago. A fair average price for galvanized is 4.94c, Chicago. The wide discrepancy in quotations arises from the fact that some galvanizers are fairly well supplied with spelter while others must buy in the open market, subject to wide fluctuation.

Sheets Stronger

Cincinnati, Nov. 23.—Sheets are rapidly growing stronger. Black No. 28 gage are now quoted at 2.35c, Pittsburgh basis, and are showing a tendency to go higher. Galvanized No. 28 are given at from 4.40c to 4.50c, Pittsburgh, which is an advance of almost a half cent a pound over last week's figures. Business is mostly in spots, the tonnage of sales being light. Sheet bars are at a premium because of heavy demand for them from the east.

Advance $4 in East

Philadelphia, Nov. 22.—Blue annealed sheets with eastern makers advanced more rapidly the past week than at any time yet and now are quoted $4 higher or at 2.20c, Pittsburgh, or 2.359c, Philadelphia, for No. 10 gage. The demand is active. Eastern makers have taken numerous contracts for first quarter and now are well sold up. Higher prices are expected.

Growing Scarcity

Buffalo, Nov. 23.—There is a very strong demand for black sheets. Producers and selling interests report a growing scarcity accompanied by advancing prices. Deliveries in this line are also becoming more extended.

Tin Plate Price Held

Pittsburgh, Nov. 23.—For the first time in many years, tin plate manufacturers are not scrambling to obtain contracts for next year's delivery. The $3.60 base price is being maintained by the leading mills in this district, although reports of that figure being shaded for immediate shipment are heard. That prices for 1916 delivery will advance, is the expression made by a number of manufacturers.

(For complete prices see page 1060.)

Billet Buyers

Have Difficulty in Placing Orders—Very High Quotations

Philadelphia, Nov. 22.—Billet orders continue to go begging with makers in this district. One eastern producer has disposed of a large portion of its first quarter output at $45 to $50, mill, for ordinary forging, and at $35 to $36, mill, for open hearth rerolling billets. Another large eastern maker is completely out of the market for first quarter. Other local representatives of western mills are in the same position and report they readily could obtain about $35, delivered, this territory, or $32 at the works for bessemer steel. For ordinary forging billets it is stated by makers $50, mill, can be easily obtained. A small tonnage went at $49, Pittsburgh. Export inquiries excite no interest, so heavy is the unsatisfied home demand.

Semi-Finished Strengthens

Pittsburgh, Nov. 23.—Billets, sheet bars, wire rods and muck bars continue their march toward higher levels. Some people in close touch with the situation say neither billets nor sheet bars are obtainable at less than $30, mill. Wire rods are not being offered in the open market; they nominally are quoted at $37, Pittsburgh. Muck bars, offered at $30 a ton several weeks ago, now is nominally quoted at from $31 to $32, Pittsburgh.

Some High Prices

Youngstown, O., Nov. 23.—Recent sales of open hearth soft steel billets have been made as high as $34, Pittsburgh. Sales of forging billets, 20 per

cent crop ends, have been made at $39, which includes the regular differential of $5 a ton over soft steel billets. Bessemer steel prices also have strengthened perceptibly. It is believed doubtful by valley sellers whether less than $30, Youngstown, could be done, and $28 represents the very bottom of the market, both for billets and sheet bars. An export inquiry for 30,000 tons of billets and sheet bars was offered a valley maker this week at $32, f. o. b. New York, or $29.85, Youngstown mill, receiving no action, for the simple reason that there is not the steel to sell. A large tonnage of bessemer steel remains to be placed with domestic consumers who have not arranged for their first quarter requirements. Just now, tin plate mills are actively in the market. Two inquiries before valley makers this week aggregated 70,000 tons. A new inquiry for shell steel involves about 22,000 tons of 3¼, 3½ and 6½-inch rounds. The semi-finished steel market is necessarily nominal, owing to the scant supply of steel. Nominal quotations, as reported by valley interests, follow: Open hearth steel billets and sheet bars, $30 to $34, Youngstown; bessemer steel billets and sheet bars, $28 to $30; forging billets, $50, Pittsburgh; wire rods, $40 to $50.

Steel Bars for Next August

Were Among Orders Booked—Few Mills Can Deliver Before July

Philadelphia, Nov. 22.—On certain sizes of steel bars business was done in this district this week for August delivery. A few sizes can be offered by certain mills in several weeks, but the average calls for about April-May delivery. All makers now quote 1.70c, Pittsburgh, or 1.859c, Philadelphia, but they are willing to accept very little new business at any figure. A Lebanon buyer offering 1,000 tons of rivet rods and 300 tons of nut steel, practically regardless of price on delivery, still is trying to induce makers to accept this order. The market for large rounds for shrapnel or high explosive shells is less active, for while there are numerous unsatisfied requirements, few mills can sell before July 1. The Diamond State Steel Co. mill at Wilmington, now undergoing rehabilitation, has a promised round tonnage for first half for which negotiations continue. Some makers hold out for 3.75c, mill minimum, on new orders. It is learned that a sale of large rounds made here last week at 4.00c, mill, calls for cut lengths.

Bar Iron Stronger

Chicago, Nov. 23.—Makers of bar iron in the Chicago district are naming 1.60c, Chicago, as their minimum and higher prices are being obtained for delivery into next year, where makers are willing to contract for that delivery. Some mills are not taking further tonnage at present, being comfortably well filled and believing it wise not to sell against their production of next year at this time.

Higher prices for iron are dictated by greatly increased cost of scrap and by a stronger demand resulting from iron bars being bought to use in places where steel bars ordinarily are employed. Difficulty in obtaining delivery on steel bars is throwing some tonnage to iron mills.

Steel Bars Strong

Pittsburgh, Nov. 23.—Advances registered by the market for bar steel have been followed by the adoption of higher prices by manufacturers of spikes, nuts, bolts and rivets, cold rolled steel shafting, chain, etc. Steel bars are firmly held at 1.70c, the highest quotation named by the Carnegie company since the formation of the Corporation. Foreign agents are endeavoring to buy heavy tonnages of shrapnel rounds, which are being held at as high as 4c for larger sizes. Bar iron manufacturers have advanced prices $2 a ton to 1.70c.

Bars to Command Premium

Chicago, Nov. 23.—Most makers of steel bars find their mills sold out practically to the middle of next year. A nominal quotation of 1.89c, Chicago mill, is made, but bars for anything like prompt delivery obtained from smaller producers who have reserved some capacity command prices much higher. From $2 to $4 per ton over the prevailing quotation is not unusual and rumors have been heard of 2.29c, Chicago, being paid for prompt steel.

Fighting Off Business

Cleveland, Nov. 23.—Leading companies are quoting from 1.70c to 1.80c, Pittsburgh, on shapes, plates and bars, but are not guaranteeing any delivery. The Carnegie Steel Co. is not taking any business except from warehouse. All of the companies are fighting off orders, owing to the congested condition in the mills and are confining their efforts to carrying out their contract obligations.

Scarce Out of Market

Buffalo, Nov. 23.—Bar prices have advanced to a nominal asking price of 1.70c, base, with the usual extras, and to desirable customers only. Most of the agencies are out of the market on bars and the other standard finished material lines, with the exception of special cases, and have practically no tonnages open for delivery over the next six months. Deliveries on bars under contract are becoming more extended, the average now being from 5 to 7 months.

Premiums For Bar Iron

Philadelphia, Nov. 22.—While the present minimum price on iron bars with eastern Pennsylvania makers is 1.60c, Pittsburgh, or 1.759c, Philadelphia, premiums of from $1 to $4 a ton are being obtained for quick shipment. Most of the mills are booked up four to six weeks.

Not so Excited

New York, Nov. 23.—Quieter conditions are prevailing in the market for large rounds, for the reason that makers have contracted to fill a tonnage which will take up the greater part of their capacity to July 1 and buyers cannot get desired mill positions. Furthermore, J. P. Morgan & Co. and other representatives of the entente powers in this country have not been authorized to buy rough steel for delivery beyond July 1. There is considerable steel available in the market from domestic shell makers for such mills as have steel to offer. An eastern Pennsylvania steel maker in the week sold about 10,000 tons of rough forgings to a domestic shell manufacturer. A New Jersey manufacturer of mining machinery bought 5,000 to 6,000 tons of 5½ to 6-inch rounds additional. Large round prices range from 3c to 3.75c, mill. The mills are being offered ordinary steel bar business for their best delivery at 1.70c, Pittsburgh, but since this means well into the second quarter for most of them, there is small inclination to sell, even at this price.

Hoops, Bands, Shafting, Strip Steel

Pittsburgh, Nov. 23.—Cold rolled steel shafting is being held at 50 per cent off the list by some makers, or $5 a ton above the nominal market price. Cold rolled strip steel has been advanced $5 a ton by Pittsburgh manufacturers. Hoops continue to be

(*For complete prices see page* 1060.)

offered at 1.75c and bands are commanding 1.70c. Deliveries of all four products are deferred from two to six months.

Falling Into Line

Youngstown, O., Nov. 23.—The pipe market, normally the last to respond either to general business improvement, or to sympathize with trade depression, is falling into line with the other branches of the iron and steel trade. Demand is good for all descriptions of pipe. Much building is going on over the country and the oil market betterment has stimulated oil-country development. This increased demand together with the higher steel costs give rise to expectations by independent makers that a general advance in prices will be forthcoming before long.

St. Louis Pig Iron

St. Louis, Nov. 23.—An inquiry for tons of high silicon iron and one for a car of ferro-manganese are about the most interesting items in the iron market here this week. Sales last week included 3,000 tons of car wheel iron and 1,000 tons of Southern No. 2, together with rather unusual number of small lots. Southern No. 2 is strong at $14 to $14.50, Birmingham, for first half delivery while northern iron is held at $17.50 to $18 at Chicago and $16.50 to $17, Ironton. The tone of the market is good, and higher prices are expected to follow soon.

Coke Prices Firm

St. Louis, Nov. 23.—Coke is firm at $3.25 to $3.50 a ton for Connellsville 72-hour foundry grades, and at $3.50 to $3.75 for New River, West Virginia. The demand is light, but one local foundry closed for about 1,000 tons last week.

Bid on Pipe

Jersey City will receive bids Dec. 2 on 1,800 tons of 48-inch flexible joint pipe. A heavy tonnage of large pipe for the reconstruction of the Salem, Mass., water system, which was offered at one time and subsequently withdrawn, now is being talked about again and it is reported may come out in December. More than 10,000 tons will be required.

The Scranton Pump Co., Scranton, Pa., has issued a four-page pamphlet describing its line of pumps. The operation of power pumps is discussed in detail.

Advances in Plate Prices

Have Not Stopped Buying—One Eastern Mill Still Taking Orders at Three Times Its Production

Philadelphia, Nov. 22.—Sharp advances in plate prices have failed to cool the ardor of buyers and eastern mills still struggle against an excessive demand. One eastern maker continues to enter orders at a rate three times its production. Trouble to get steel is bringing nearer the possibility of operations of consumers' plants being handicapped. Car builders are predicting some shut downs of their shops by the second quarter, if present conditions continue. Some ship work at Atlantic yards is being held up by tardy plate shipments by eastern mills. After being in effect but a few days, the 1.70c, Pittsburgh, or 1.859c, Philadelphia, price, is being discarded by eastern mills. One is quoting 1.80c, Pittsburgh, and another 1.85c, Pittsburgh, for immediate specification. For early shipment, 2c, mill, has been paid. More first quarter contracts have been taken by one eastern mill at 2c, Pittsburgh, or 2.159c, Philadelphia. About 2,000 tons of steel will be required for a large car ferry for the Florida East Coast railway recently ordered of the Cramp yard. A large tank boat inquired for by the Southern Pacific Steamship Co. will require 5,000 to 6,000 tons.

Plates Sell at 2c

Pittsburgh, Nov. 23.—In adopting the 1.70c price last week, the Carnegie Steel Co. listed plates, shapes and bars at the highest figure to be quoted by that interest since the formation of the United States Steel Corporation. The Carnegie company, Jones & Laughlin Steel Co., the Cambria Steel Co. and the Republic Iron & Steel Co. are refusing to sell material at less than 1.70c for delivery at the convenience of the mill. Some mills have sold plates at 2c for prompt delivery in this district. It is understood the Pennsylvania railroad, which inquired for 11,000 freight cars, will not close negotiations for the present on account of prevailing high prices of structural material. The Pennsylvania Lines West last week ordered 63 freight locomotives, 48 of which will be built by the American Locomotive Co. and 15 by the Lima Locomotive Corporation.

Higher at Cleveland

Cleveland, Nov. 23.—Cleveland mills have again advanced quotations so far as everything except most desirable business is concerned and from 2c to 2.10c is being quoted for prompt delivery. Eastern Pennsylvania mills are quoting from 2.05c to 2.15c and in one case where assurance of delivery within three weeks was given, 2.25c, Pittsburgh, was quoted.

Steel Plates Scarce

Chicago, Nov. 23.—Conditions in the steel plate market are parallel with other finished steel products and most producers are unable to sell additional tonnage for delivery within the next seven months. The nominal quotation of 1.89c, Chicago, is named but mills able to make reasonably prompt delivery are obtaining several dollars per ton higher.

(*For complete prices see page* 1060.)

Eastern Scrap Market

New York, Nov. 23. — Offer in the local market of $16.25 to $16.50, delivered, in the Pittsburgh district for heavy melting steel, which is equivalent to $13.50 to $13.75, New York, is causing some flurry in that grade, as these prices are at least from 50 cents to $1 above those obtainable for eastern Pennsylvania delivery. In one instance, $14, New York, is reported to have been offered for steel for Pittsburgh delivery. The result of the higher steel market in Pittsburgh is that material is being drawn there from not only this city but from such neutral points as New York state and New England. A continuance of the Pittsburgh demand probably will tone up the eastern market, which while showing some tendency toward improvement, has remained irregular. Cast scrap and stove plate are in good demand and are higher.

Wages Increased.—An increase in wages on all day and piece work has been announced by the Yale & Towne Mfg. Co., Stamford, Conn., maker of builders' hardware, affecting about 4,600 employes. The increase will add between $200,000 and $300,000 a year to the company's pay roll.

Report Denied.—The report that Chas. M. Schwab and associates have obtained control of the Danville Structural Tubing Co., Danville, Pa., and will erect a new plant to increase the capacity of the works, is denied by officials of the Bethlehem Steel Co.

Chicago Scrap is Higher

And Quotations in Other Centers Are Also Marked Up—Improvement With Some Irregularity

Chicago, Nov. 23.—There seems to be no top to the scrap iron and steel market in Chicago, and the situation is entirely in the hands of sellers, who seem disposed to make the traffic pay all it will bear. Considerable purchases of heavy melting steel during the past week by large steel interests here were made at prices approximately $2.50 per ton higher than the last considerable movement of tonnage. Heavy melting steel now is quoted at only a shade under $15 and seems likely to reach that figure at any time and possibly to go considerably beyond. Other lines of scrap are similarly affected and the entire list is on a distinctly higher plane than last week.

Four railroad lists are now actively before the market, the Chicago, Milwaukee & St. Paul railroad offering 8,000 tons, the Rock Island railroad 4,800 tons, the Northern Pacific railroad 450 tons of steel axles and the Chicago, St. Paul, Minneapolis & Omaha railroad 2,000 tons of long steel rails.

Market Moving Rapidly

Cincinnati, Nov. 23.—The iron and steel scrap market is moving at a rapid pace. Shipments continue exceptionally heavy to rolling mills, and jobbing foundries are consuming as much scrap as at any time in the past 10 years. Prices show a decided tendency to fluctuate due to the fact that dealers are changing quotations after almost every sale, but the general tendency is toward a higher level. From a summation of dealers' reports, heavy melting steel, No. 1 machine cast, No. 1 busheling, bundled sheet scrap and stove plate are the best sellers in the market at present.

Covering Short Orders

Buffalo, Nov. 23.—The most noticeable feature of the market is the effort being made on the part of a number of the dealers to cover short orders, particularly in heavy melting steel. In some cases, it is reported prices have been paid by the dealers for this line considerably above the price being paid by the local consumers. A number of orders were booked in heavy melting steel at $15, f. o. b. Buffalo. Tonnages of heavy low phosphorus steel scrap are scarce and in the face of this situation the demand is strong. Prices have advanced 50c per ton in the past few days, the market now being $19 to $19.50.

Heavy melting steel is now holding firmly here at $14.50 to $15. Advances of 50c per ton are also reported in No. 1 railroad wrought, old iron axles, old steel axles, car wheels and malleable. There has also been an advance in clean cast borings.

Scrap Shows Strength

Pittsburgh, Nov. 23.—The market for old materials reflects considerable strength. Heavy melting steel is being held at $16.50, and above, it being reported that as high as $17 a ton has been paid by dealers. Rerolling rails have commanded $17 a ton and other grades are selling at figures higher than those prevailing a week ago. Machine shop turnings are being offered in large quantities by manufacturers of shrapnel shells.

Improvement in East

Philadelphia, Nov. 22.—Some improvement continues in the eastern Pennsylvania scrap market and this is being accelerated somewhat by the reports of higher prices in the Pittsburgh district, especially for heavy melting steel, which operate to draw material there from neutral territory. Although three eastern Pennsylvania works recently paid the railroads direct over $15, delivered, for heavy melting steel, they will not offer even $15 to the brokers or dealers. There is more speculation in steel among the brokers who are offering $14.75 to $15, delivered. No. 1 railroad wrought is very strong and one New Jersey mill paid $18, delivered. Cast scrap also shows strength, but turnings, because of the large production of this grade at present, are heavy. The government took bids today on 15,000 tons of mixed Panama canal scrap, including 5,000 tons of cast, 5,500 tons of heavy steel and the rest in several grades.

Advance in St. Louis

St. Louis, Nov. 23.—There has been a feverish advance in nearly all prices this week. All of the large consumers of melting steel now are in the market actively and are willing to purchase at top prices. Dealers were active in bidding on railroad lists which closed recently and at high prices. Standard relaying rails are in good demand and prices are advancing steadily. The only railroad lists out are one for 2,000 of standard section steel rails, offered by the Chicago, St. Louis, Minneapolis & Omaha, and a small item of 50 tons offered by the Pullman Co.

(*For complete prices see page* 1060.)

Rivets Advance

Moved Up $4 and Nuts and Bolts Are Also Higher

Pittsburgh, Nov. 23.—Nut and bolt manufacturers advanced prices about 10 per cent last Thursday to meet higher prices of bar steel. Rivets have been put up $4 a ton to 2.45c for structural and 2.50c for boiler rivets. Despite sharp advances made by rivets the last few months, it is not unlikely that another advance of $2 a ton will be announced next week.

Wire Mills

Are Forced to Withdraw From Market—Can Not Give Deliveries

Pittsburgh, Nov. 23.—A number of wire manufacturers have been forced to withdraw from the market, because of inability to promise deliveries until after July 1, 1916. Specifications are coming out in heavy volume and new inquiries involve considerable tonnage. Demand for barb wire for export has not diminished in volume. Wire nails are held at $1.90 a keg, the highest price to prevail since 1909, and talk of an advance of $1 or $2 a ton is heard.

Chain Advanced

Pittsburgh, Nov. 23.—Steel chain manufacturers in the Greater Pittsburgh district have put up prices $1 a ton to 3.35c for ⅜-inch proof coil. Demand continues heavy and most makers are several months deferred in shipments.

Three More Furnaces

The American Steel & Wire Co. will build three additional open hearth furnaces and a 1,000-ton mixer at Donora, Pa. Owing to the very heavy demand for wire products, these additions, as well as those recently announced to be made at Cleveland, have been rendered imperative.

George Franklin Howard, general sales agent in Chicago for the Atlas Tack Co., Fairhaven, Mass., died Nov. 22 at his home in Oak Park, aged 71 years. He was a veteran of the civil war, serving as captain in Fortieth Massachusetts Infantry. He is survived by his widow and two sons.

New Awards

Are Not Numerous—Portable Bridges for British Government

New York, Nov. 22.—A recent inquiry for 200 portable bridges weighing about 3,000 tons, inquired for by the British government in this country through J. P. Morgan & Co., has gone to an English fabricator. The Dominion Bridge Co. originally appeared to be low on this order, but it turned out subsequently that a home shop had submitted the most favorable figure. Several shops in this country bid upon the business. Apart from subway and elevated railroad work, of which about 40,000 tons are pending, new offerings in this district are not heavy. Some work for spring delivery continues to be hurried forward in view of delayed mill shipments, but it is still too early to determine the relative amount of the approaching season's business in new buildings in this district. Mill shipments continue far in arrears. Prices are strong and steady with 1.70c, Pittsburgh, or 1.869c, New York, the common figure, although one eastern mill has been quoting 1.75c, or around 1.84c, New York.

High Prices Finally Paid

Philadelphia, Nov. 22.—Large consumers of shapes show no hesitancy in paying the higher prices asked by eastern mills even on forward contracts. One of the largest buyers contracted for 2,000 tons for first quarter at 1.70c, Pittsburgh, or 1.859c, Philadelphia, which is the minimum figure on contracts. Miscellaneous orders have been bringing up to 2c, eastern mill, but one maker has been taking some orders at 1.75c, mill. Eastern makers are finding it impossible to satisfy the demand and a good many customers are disgruntled, but the situation seems to have gotten beyond the control of the mills. New business is so liberally offered that producers find it necessary to turn down thousands of tons weekly.

Shape Deliveries Deferred

Pittsburgh, Nov. 23. — Structural shapes are commanding 1.70c and above in the Greater Pittsburgh district. Fabricators are unable to obtain material for anything like nearby delivery, and builders of steel cars are complaining about deferred shipments. Most mills have enough tonnage on their books to operate at maximum capacity until July 1 next.

Will Require Large Tonnages

Buffalo, Nov. 23.—Prices have advanced to such an extent that they are now from $5 to $7 per ton higher than they were a month ago. Some of the fabricators of the Buffalo district have withdrawn, it is understood, all quotations made prior to Nov. 1.

The purchase of the New York State Steel Co.'s plant by William H. Donner, head of the Cambria Steel Co., and the immediate steps being taken to put the plant in shape for re-opening, plus alterations, additions and extensions will require large tonnages of structural material. It is estimated that about $2,000,000 is to be expended on the plant. The building of an auxiliary steam electric power plant by the Buffalo General Electric Co., to supplement the company's present hydro-electric power service, and to cost about $2,000,000 was announced today. Charles R. Huntley, general manager of the company, said the plant is to be fireproof and modern in every respect. It is to be completed within a year, and will generate about 40,000 horsepower. This large plant to be erected on the Niagara river to the north of the city line will also require a large tonnage of structural material. The details will be announced later.

Structural Market Active

Chicago, Nov. 23.—Contracts closed in the west during the past few days for structural material involve larger tonnage than has been the case for some time. The principal item this week involves 8,000 tons for an open hearth and mixer building for the Inland Steel Co. at Indiana Harbor, which will be furnished by the McClintic-Marshall Co. The Minneapolis Steel & Machinery Co. has taken 2,075 tons for the Hennepin Holding building, at Minneapolis. Other tonnages recently closed are for smaller lots, well scattered as to location and well divided among fabricators.

CONTRACTS AWARDED.

Inland Steel Co., open hearth and mixer buildings, Indiana Harbor, Ind., 8,000 tons, to McClintic-Marshall Co.

Hennepin Holding building, Minneapolis, Minn., 2,075 tons, to Minneapolis Steel & Machinery Co.

East St. Louis Cotton Oil Co., two storage buildings, East St. Louis, Ill., 890 tons, to Lackawanna Bridge Co.

Orpheum theater building, St. Louis, Mo., 648 tons, to Spuck Iron & Foundry Co.

Colorado Packing & Provision Co., killing building, Denver, Colo., 627 tons, to Hansel-Elcock.

Adam Schaaf building, Chicago, 587 tons, to Vierling Steel Co.

Ranier Realty Co., 6-story office building, St. Louis, 414 tons, to Christopher & Simpson.

Marine Barracks, Mare Island Navy Yard, San Francisco, 300 tons, to Golden Gate Iron Works.

Bridge work for the Baltimore & Ohio, 1,200 tons, to the Mount Vernon Bridge Co.

Buildings and stacks for three open hearth steel furnaces for Pittsburgh Steel Co., 600 tons, awarded the Jones & Laughlin Steel Co.; building to house furnaces, 1,700 tons, awarded Riter-Conley Mfg. Co.

Factory building for Mann Bros., Long Island, 400 tons, to the Hinkel Iron Works.

Building for the Seneca Falls Mfg. Co., Seneca Falls, N. Y., 500 tons, to a local shop.

Bridge work for the Central Railroad of New Jersey, 300 tons, to the Pennsylvania Steel Co.

Bridge work for the Chesapeake & Ohio railroad, 700 tons, to the Mount Vernon Bridge Co.

Extensions to the plant of the Worth Bros. Co., Coatesville, Pa., 1,000 tons, to I. F. Shoemaker & Co.

Mercantile building for David Dows, Water and Montgomery streets, New York, 700 tons, to the Eastern Steel Co.

New fabricating plant for the McClintic-Marshall Co. at Pottstown, Pa., about 3,000 tons, steel work to be furnished by the company.

Apartment house for Goldberg & Kramer, Forty-ninth street, New York City, 250 tons, to the Passaic Structural Steel Co.

Apartment house at Fifth avenue and Sixty-third street, New York City, 700 tons, to the Hay Foundry & Iron Works.

Raritan building, Perth Amboy, N. J., 200 tons, to the Industrial Iron Co.

Wisconsin Traction, Heat, Light & Electric Co., Appleton, Wis., power house, taking 1,000 tons, to Lackawanna Bridge Co., Buffalo.

C. Klinck Packing Co., Buffalo, packing-house addition, 100 tons, to C. F. Ernsts' Sons Co., Buffalo.

Buildings for Aluminum Co. of America, 1,000 tons, awarded McClintic-Marshall Co.

Steel riffle plates for Alaska Crow Creek Mining Co., 250 tons, awarded Carbon Steel Co.

Buildings for Pennsylvania Smelting Co., 200 tons, awarded McClintic-Marshall Co.

Bridge for Youngstown Sheet & Tube Co., 400 tons, awarded McClintic-Marshall Co.

Sheds for Lehigh & Wilkesbarre Coal Co., 300 tons, awarded Fort Pitt Bridge Works.

Rolling mill building for the Lukens Iron & Steel Co. Coatesville, 1,000 tons to the Eastern Steel Co. about 2,500 tons for the open hearth building still pending.

CONTRACTS PENDING.

Third tracking of the elevated lines in the Bronx, for the Interborough Rapid Transit Co., 10,000 tons requirement now before fabricators.

Garage for the Hudson Motor Car Co., New York City, 500 tons, bids being taken.

Pier for the Baltimore & Ohio railroad, Baltimore, 2,000 tons, bids being taken.

Bridge for the New York, New Haven & Hartford railroad across the Thames river, New London, Conn., about 6,000 tons, tentative plans again being considered.

Office building for the Oceanic Realty Co., Forty-second street and Fifth avenue, New York City, 1,800 to 2,000 tons, bids about to be taken.

House for the Detention of Women, West Thirtieth street, New York City, 1,000 tons, bids being taken.

Addition to office building, John street and Broadway; New York City, 300 tons, bids being taken.

Stopped Temporarily.—The Moose Mountain iron mines, at Sellwood, in northern Ontario, have been closed temporarily. The Grondal process of concentrating is being used, making briquettes analyzing 63 per cent iron. The operations have been stopped in order to permit some changes in machinery to be made.

(*For complete prices see page* 1060.)

Orders for Cars Are Slow

High Prices Said to Cause Delay—Pennsylvania System Has Not Allotted Its 11,000 Cars

New York, Nov. 23.—Some signs are present that increased prices, as well as scarcity of steel are having a tendency to hold back additional car orders. The Pennsylvania system, which took bids a week ago on about 11,000 cars, has made no awards and it is reported is deliberating on the matter because of the higher prices quoted. This system, however, has bought locomotives freely, placing 48 with the American Locomotive Co. and 15 with the Lima Locomotive Corporation and in addition has arranged to build at least 50 at Altoona. The Elgin, Joliet & Eastern has placed 27 locomotives with the American Locomotive Co. and the Oahu Railway & Land Co. of Honolulu, three with the same builder.

The Pullman Co. has taken an order for 1,000 additional freight cars from the Western Maryland railroad.

The Chicago, St. Paul, Minneapolis & Omaha has bought 10,000 tons of rails of the Lackawanna Steel Co. and the same mill will furnish 5,000 tons of the recent Northern Pacific order. The Maine Central has closed on its inquiry for 10,000 tons, of which the Lackawanna Steel Co. will furnish 1,500 tons and most of the rest will go to the Bethlehem Steel Co. The latter is expected to obtain the 4,000 tons for the New York, Ontario & Western. The recent order of the Reading called for a total of 20,000 tons, divided among the Pennsylvania, Bethlehem and another mill. The Baltimore & Ohio has taken 3,500 tons from the Bethlehem Steel Co. Traction lines have closed for about 5,000 tons of girder rails with an eastern mill for first half. At the close of last week, bids went in at Paris on 100,000 tons of 91 to 100-pound rails for the French government railways. Several of the American mills did not quote because they were unable to make desired deliveries.

A leading maker of spikes has advanced to 2c, Pittsburgh, for standard, to 2.10c for ½ to 7/16-inch and 2.20c for 5/6 and ⅝-inch.

Track Equipment Higher

Pittsburgh, Nov. 23.—Standard railroad spikes now are being held at 2c, or $3 a ton above the previously prevailing price. Smaller sizes are commanding from 2.10c to 2.25c. Track bolts, previously listed at 2.25c, now are held at 2.50c. Demand for both products is described as fairly heavy.

The Pennsylvania Lines West have placed contracts for 63 freight locomotives of the H.-10 type for delivery next year. The American Locomotive Co. will build 48 and the Lima Locomotive Corporation 15. Last year the Pennsylvania Lines West did not figure in the locomotive market, but received 50 locomotives, obtained through contracts placed in 1913.

Spikes Are Higher

Youngstown, O., Nov. 23.—The advance in the price of steel spikes of $3 a ton is being adopted by independent makers. At 2c, Pittsburgh, the price is the highest in several years. The Erie railroad is in the market for a big lot of spikes.

Buys Locomotive

The Youngstown Sheet & Tube Co., Youngstown, O., has purchased from the Baldwin Locomotive Works one 17 x 20-inch 50-ton N. G., 4-wheel, saddle-tank locomotive for use in connection with its open hearth extension.

Will Buy Rails

St. Louis, Nov. 23.—Judge Elmer B. Adams, of the United States Circuit Court, has granted the request of Ben F. Bush, receiver for the Iron Mountain and Missouri Pacific railroads, to authorize the expenditure of certain sums of money for the rehabilitation of the systems and the purchase of equipment. In the case of the Iron Mountain, the receiver is authorized to spend $175,000 for steel rails to replace old ones on certain parts of the division. In the case of the Iron Mountain, the receiver was authorized to expend $530,630 for new steel rails to replace old and worn out ones, and $273,220 for improvement of roads and equipment.

Will Machine Shells

Charles A. Otis, broker and capitalist of Cleveland, has announced that preparations are being made at the plant in Lorain, formerly owned by the Brown-Cochrane Co., and later by the Cleveland Ice Machine & Mfg. Co., to fill a war order for machining 200,000 high explosive shells for the Russian government. The plant has been bought by a company organized by Mr. Otis some time ago and a special contract for the machining of the shells was closed with the Bethlehem Steel Co. Mr. Otis' company also is negotiating for an order to machine 300,000 more shells. Mr. Otis states that his company has control of several plants in and near Cleveland for use in manufacturing munitions.

(*For complete prices see page* 1060.)

Ferro Firmer

And Premiums Are Paid for Prompt Delivery

New York, Nov. 23.—Export inquiries for ferro-manganese again have appeared in some volume before domestic makers. Italy has asked for 1,200 tons, Russia for a smaller amount and there have been other lots offered for prices. English makers are bidding on these inquiries direct and will not permit their agents in this country to do so, under the guarantees previously given.

Variations in the price of ferro-manganese under $100, seaboard, seem to have disappeared. Sellers have no trouble to get $100 for contracts up to July 1, which is quoted by both English and domestic makers and premiums of $3 to $5 a ton frequently are obtained on prompt shipments. Some fair sales are being made, but the movement is not heavy. A large steel company at Pittsburgh took 1,500 tons of domestic for first half at $100, seaboard. The seller now is reported out of the market. It is reported a steel maker in the Youngstown district has arranged with an eastern furnace to convert a cargo of manganese ore.

New licenses for December loading now are being granted to this country by the British government. It is reported that the MALVERN RANGE, which was to bring several thousand tons under November licenses, now may be held back to arrive in December and its cargo increased to 5,000 to 6,000 tons.

Lower Grades Advanced

Pittsburgh, Nov. 23.—Lower grades of bessemer ferro-silicon again have been advanced $1 a ton, 12 per cent being held at $28, furnace, for first quarter shipment. Silvery iron also has been put up $1 a ton; 8 per cent is held at $23, furnace. Demand for 50 per cent and lower grades of ferro-silicon continues heavy. Several sellers have withdrawn from the market. The market for 80 per cent ferro-manganese shows no change in position.

Gray & Davis Co., Amesbury, Mass., manufacturer of automobile lamps, last week received an order for 500,000 brass cases for shells and, in order that they may be made at its plant there, additional space has been secured. The contract involves the immediate purchase of approximately 1,500,000 pounds of brass.

Warehouse Prices

Are Advanced at Pittsburgh—Great Activity at Cleveland

Pittsburgh, Nov. 23.—Plates and shapes have been advanced $2 a ton and steel bars $4 a ton for delivery from warehouses in Pittsburgh. All three products now are held at 2.35c. Rounds and squares, 2 inches and larger, are held at 2.65c. The adoption of the 2.35c price was caused by the advances registered by the market for plate, shapes and bars the last few weeks.

Very Active at Cleveland

Cleveland, Nov. 23.—Following the receipt of the news that Pittsburgh prices on shapes, plates and bars had been advanced to 2.35c from warehouse—an advance of $4 on bars and $2 on shapes and plates—Cleveland warehouse men have discussed making another advance in this market, where the demand is very active. The Chicago market is, however, still lower than that in Cleveland and it has been necessary in competitive territory to shade the Cleveland price to meet Chicago competition. This shading will be discontinued and probably another advance in Cleveland prices is not far distant. Orders of the past week included one for 66 tons of bars for shipment to Japan and it seems probable that further foreign orders will be received. Warehouse business in Cleveland is running ahead of the record-breaking business of last month.

Warehouse Business Brisk

Chicago, Nov. 23.—Warehouse prices are at the same levels as last week except that No. 28 gage galvanized sheets are now sold at 4.35c to 4.60c, Chicago store. Business is on the increase as deliveries of steel from mills becomes increasingly difficult.

Large Rounds Scarce

Philadelphia, Nov. 22.—There is a great scarcity of large rounds among the warehouses in this city and Baltimore. Stocks are pretty well cleared of these sizes. A few sales are being made at from 2.25c to 2.45c, delivered in this district. Philadelphia warehouse prices on other bars, plates and shapes are up $2 a ton further to 2.20c.

Entertains Its Employes

M. D. Valentine & Bro. Co., Woodbridge, N. J., recently celebrated its fiftieth anniversary by entertaining its 600 or more employes, many of whom have put in 25 years, while a few have been with the concern since its formation. The company, which, in addition to its regular line of high grade fire brick for heating furnaces and soaking pits, manufactures cupola linings and all kinds of refractory shapes, was founded in 1865 by the late Mulford D. Valentine, a director of the Pennsylvania railroad, and his brother, J. Rossiter Valentine. The latter continues as president, with H. Duguid vice president and Frank R. Valentine secretary.

Open Hearths

And Rolling Mills to be Built by the Inland Steel Co.

Chicago, Nov. 23.—Inland Steel Co., Indiana Harbor, Ind., has started work which will add 50 per cent or more open hearth capacity and increase its finishing mill capacity. A contract has been let to the McClintic-Marshall Co. for an open hearth and mixer building involving about 8,000 tons of structural steel and work will be started this week clearing the ground and placing foundations. Six or more open hearth furnaces will be housed in this building with space for additional equipment of this kind. It has not been definitely determined whether a mixer will be installed at present or later. The Inland Steel Co. at present has 12 open hearths and the present addition will be a large increase.

A blooming mill will also be erected and a finishing mill as well, the character of the latter not yet having been decided.

The new open hearth and rolling mills will be located on the lake front on the opposite side of the railroad tracks from the main plant and eventually most of the works will be on the side.

Big Grinding Machine

Norton Grinding Machine Co., Worcester, Mass., has recently shipped to the Carnegie Steel Co., Pittsburgh, the largest and heaviest roll grinding machine ever made in the world. It weighs 55 tons and required three flat freight cars to transport it to its destination. The machine is composed approximately of 1,200 parts and is capable of swinging a roll 50 inches in diameter and weighing 32 tons on centers and grinding a length up to 21 feet long. It is capable of removing from 2 to 4½ cubic inches of metal in a minute. Four motors are used on the machine with a total of 65 horsepower. The machine has all of the accuracies of adjustment that may be found in the smaller types of grinding machines and is simply a precision grinding machine on a much larger scale. It differs from the original machine built for the National Tube Co., Lorain, a few years ago in that certain features in the construction have been changed to meet new requirements and the capacity of the machine slightly increased.

(For complete prices see page 1060.)

More Furnaces

And Merchant Mill Being Added by Lackawanna Steel Co.

Further extensions to both the open hearth steel works and to finishing department of the Lackawanna Steel Co., at Buffalo, have been authorized by the directors. Two additional 80-ton stationary basic open hearth furnaces are being completed in the No. 2 plant which will increase the total present capacity of this plant to two Talbot tilting furnaces and six stationary furnaces. The foundations also are in for two more stationary furnaces as a total of eight of this type have been planned for the No. 2 plant. With the two new open hearth furnaces now under construction, the total open hearth capacity of the Lackawanna Steel Co. will consist of 20 stationary and two tilting furnaces. A 10 and 12-inch merchant bar mill for the rolling of small sizes also is being installed. This will increase the bar mills of the company to four, one of which is a combination unit. The new mill will be known as the No. 10 mill.

"Have No Fight With Anyone"

E. V. Babcock, member of the Replogle syndicate at whose home in Pittsburgh last week a meeting was held to discuss the Cambria Steel Co., before leaving for the east issued the following statement:

"We paid $15,000,000 for the stock which the Pennsylvania Railroad Co. held in the Cambria Steel Co., and we consider that we have a good control of the property, but we have made no concrete plans for the future. Last week there was a contest for these 240,000 shares, but we got them, and now have no fight with any one. It will take a little time for us to shape our plans, and just what they will be when all is said and done, I am not yet able to say."

The Alma Standard Foundry Co., of Alma, Mich., will move to Saginaw. The company now manufactures small castings and will later engage in the manufacture of malleable iron castings.

Buffalo Plant

Purchased by Wm. H. Donner, Who Will Make Extensive Improvements

Buffalo, Nov. 23.—James S. Thompson, chairman of the committee representing bondholders of the New York Steel Co., announced Friday that arrangements had been completed for the sale of the property of the New York Steel Co. to William H. Donner, president of the Cambria Steel Co., or to a corporation to be organized by him for that purpose and of which he will be president. The purchase price is substantially $2,750,000, of which $2,500,000 will be accepted in first mortgage 5 per cent 20-year gold bonds, secured by a first mortgage upon the plant of the company. It is understood that Mr. Donner will endeavor to take immediate possession and to put the plant into operation at the earliest possible date. The purchase price is about 65 per cent of the face value of the old New York State Steel Co. bonds, depending somewhat on the final settlement of the committee's affairs. The purchasers intend to make extensive improvements and additions to the plant in the near future.

Looking Over Property

Wm. H. Donner, president Cambria Steel Co., accompanied by Vice President and General Manager E. E. Slick and several other officials of the Cambria company, were in Buffalo today, looking over the property of the New York State Steel Co., purchased last week by Mr. Donner. The party returned to Philadelphia this evening.

Mr. Donner said it was too early to give out a statement regarding any of the plans in connection with the re-opening of the New York State Steel plant. He said, however, no time will be lost in putting the plant in shape to go into commission.

Just as soon as the negotiations were closed for taking over the New York State Steel Co., Mr. Donner and associates ordered eight vessel cargoes of Lake Superior iron ore to be shipped down the lakes in advance of the closing of navigation. Two cargoes are to arrive tomorrow, two later in the week and the balance next week. These cargoes of ore, approximately 80,000 tons, will be unloaded at the B. R. & P. docks and hauled by rail to the plant.

Mr. Donner intimated today that the company to be organized by him to operate the property will build new docks on the Buffalo river frontage, so so as to be able to unload ore directly from lake vessels. It will install ore handling equipment, put the open hearth furnaces in shape and in the near future will add to the plant by the erection of a merchant bar mill. The plant has 66 acres with additional adjoining acreage available. The present equipment of the plant includes one blast furnace, one standard open hearth furnace and two Talbot tilting furnaces.

Sharpsville Stack

Purchased by the Allen S. Davison Co. of Fittsburgh

The Sharpsville furnace, at Sharpsville, Pa., owned by the Sharpsville Furnace Co., has been purchased by the Allen S. Davison Co., Oliver building, Pittsburgh. The stack, which has been idle several years, will be blown in Dec. 1 on bessemer pig iron and is scheduled to operate on bessemer, foundry and malleable grades. Considerable tonnage already has been sold against the output of the furnace, which has a daily capacity of about 175 tons.

The Allen S. Davison Co. now operates the Bessie furnace at New Straitsville, O., which is producing lower grades of ferro-silicon. George S. Davison is president, Allen S. Davison is treasurer and Albert P. Meyer is secretary of the Allen S. Davison Co. A. W. Thompson, president of the Inland Steel Co., obtained control of the plant in 1906. The furnace was built in 1847, but has been remodeled a number of times. It was rebuilt and new stoves erected in 1913. R. W. Coats, who has been superintendent of the plant for a number of years, will continue in that capacity.

President Thomas W. Bray, of the Republic Iron & Steel Co., announces that the company will build a modern blast furnace stack at its Hazelton group. The furnace will have a rated capacity of 550 tons a day. No. 1 Hazelton stack may be dismantled but this has not been decided definitely. The company now has seven blast furnaces in the north and three in the south.

Hudson Maxim, president of the Maxim Munitions Co., New Haven, Ct., has issued a public statement in which he says that the new corporation has no connection whatsoever with Sir Hiram Maxim, London, Eng., and that the object is to make munitions of war of all kinds, except explosive material. He states that the company has signed a contract with agents of Denmark for 30,000,000 cartridges, to be filled with 150,000 tons of smokeless powder, and that it expects to close an order soon for Maxim automatic machine guns.

Contracts Let

For Open Hearths and Mill of Lukens Iron & Steel Co.

Contracts have been placed by the Lukens Iron & Steel Co. for the construction at Coatesville of six 75-ton open hearth basic furnaces which will furnish the ingot capacity for the new 200 to 204-inch plate mill, the largest in the world, about to be installed by the company. The mill will be built by the United Engineering & Foundry Co. This extension will increase the steel works capacity of the company to 22 open hearth furnaces, one of which is of the acid type. The Lukens Iron & Steel Co. also is rejuvenating and modernizing a slabbing mill in its plant, which has not been in use for about ten years and this will serve as the auxiliary unit for the new plate mill.

Improvements now under way to the Worth Bros. Co. plant at Coatesville, of the Midvale Steel & Ordnance Co., include the installation of six 60-ton open hearth furnaces, an extension of the ore yard and other enlargements. The new furnaces will extend the ingot capacity of the works to 22 open hearth furnaces, all but one of which are of the basic type. Important mill enlargements at Coatesville are contemplated by the company and these will be announced soon, in detail.

A complete new steel fabricating plant is to be erected at Pottstown, Pa., by the McClintic-Marshall Co. in order to provide increased capacity for the company's augmented business in eastern territory. This plant will be distinct from the present fabricating shop of the company at Pottstown and will occupy a tract of 20 acres of ground just acquired, which is located between the Pennsylvania and Reading railroads. The main bridge shop of the new plant will be 390 x 618 feet in dimensions and the other buildings including templet shop, machine shop, blacksmith shop and rivet-making department, will be of proportionate size. An office building also will be included. The new plant will increase the output of fabricated steel of the company from 5,000 to 10,000 tons, monthly.

The Ohio Society of Mechanical Steam and Electrical Engineers decided while in conclave at Zanesville last week to hold its next convention at Cleveland. A number of the officers hold over and the new ones elected are as follows: President, Joseph L. Skeldon, Toledo; third vice president, E. H. Harmon, Zanesville; managers, Harry Gillett, Cleveland, and Mason Chilcote, Junction City.

MEN OF THE IRON TRADE

Who they are **Where they are** **What they are doing**

R. G. Williams, newly elected chairman of the committee for accident prevention and workmen's compensation of the National Association of Manufacturers, is a member of the American Society of Mechanical Engineers, chairman of the safety committee of grinding wheel manufacturers, which committee drafted the safety code for use and care of abrasive wheels, and a member of the standardization committee of grinding wheel manufacturers.

Mr. Williams is associated with the Norton Co., Worcester, Mass., as sales engineer. Upon graduation from Columbia, where he received the degree of B. S. and A. M., he entered the employ of the Norton Co. as a chemist in the analytical laboratory and was soon placed in charge of the mechanical division of the department of tests, later becoming assistant research engineer and safety engineer.

Mr. Williams has delivered numerous lectures on accident prevention before safety societies, commercial organizations and technical trade schools. He is a native of Mt. Vernon, N. Y., where he obtained his earlier education.

Arthur F. Clough, assistant advertising manager of the Norton Co., Worcester, Mass., has tendered his resignation to take effect this week.

Charles M. Schwab, head of the Bethlehem Steel Co., has accepted an invitation to speak before the chamber of commerce, at Pittsburgh, at its weekly meeting at the Fort Pitt hotel, Nov. 24.

J. E. Jennings, of Milliken Bros., Inc., Staten Island, N. Y., who went abroad several weeks ago in connection with a proposition involving the purchase of bridge work for the British government, has been taken ill with pneumonia.

J. D. Mooney has been appointed sales manager of the commercial department of the Hyatt Roller Bearing Co., Newark, N. J. Mr. Mooney was previously connected with the B. F. Goodrich Co., Akron, O., in charge of belting sales.

Alonzo W. Whitcomb, for ten years president of the Whitcomb-Blaisdell Machine Tool Co., Worcester, Mass., until he sold out last month to other officers of the company, has started in business for himself in that city and will make the "Worcester lathe", an invention of his own. He has leased a floor in the Winslow H. Robinson building, 68 Prescott street, and will equip it with new machinery.

Marcus A. Coolidge, head of the Fitchburg Machine Works, Fitchburg, Mass., has been unanimously nominated as candidate for mayor of that city by the independent citizens party, which is regarded almost as equivalent to election.

A. C. Dinkey, vice president of the Midvale Steel & Ordnance Co., now has his office at 1614 Widener building, Philadelphia. The general offices of the Midvale Steel Co. and the Worth Bros. Co. are located on the same floor.

R. G. WILLIAMS

Dr. John A. Brashear, president of the American Society of Mechanical Engineers, was the guest at a dinner at the Soldiers' Memorial, Pittsburgh, Nov. 24, given by a number of his friends and associates in honor of the seventy-fifth anniversary of his birth.

A. T. Lasson, Paris, representative in France for the Reed-Prentice Co., Worcester, Mass., Brown & Sharpe Mfg. Co., Providence, R. I., Billings & Spencer Co., Hartford, Ct., and other machine tool makers, is on a month's trip in the United States. He says there is a great demand for machinery in Paris, that the French government seems to have ammunition enough, but that the general feeling is that the war is to last for a long time yet, and that the country should be as well prepared as possible.

Walter F. Ripperger, of the Goldschmidt Detinning Co., 60 Wall street, has been elected a member of the New York metal exchange.

Lawrence N. Cooney, who for the past 15 years has been superintendent of the finishing mills of the Ohio works of the Carnegie Steel Co., at Youngstown, O., was tendered a farewell dinner a few days ago by the heads of the departments of the works. Mr. Cooney left Sunday for Sault Ste. Marie to assume the position of superintendent of the Algoma Steel Co., and before leaving was presented two chests of silver by his old associates.

R. B. Anthony, for the last seven years district manager of the Bristol Co., Waterbury, Conn., manufacturer of recording instruments, with offices in the Frick building, Pittsburgh, has been appointed head of the Chicago offices of that concern, effective Nov. 1. Mr. Anthony was graduated from the electrical engineering department of the University of Wisconsin in 1907, and is well known throughout the steel trade in the Greater Pittsburgh district. He will be succeeded by O. S. Tappen. Mr. Tappen has been in charge of the Chicago office of the Bristol Co. during the absence of B. J. Klein, who is in charge of the Bristol company's exhibit at the San Francisco exposition.

Will Enlarge Works

The McClintic-Marshall Co. has acquired an extensive tract of land adjoining its steel fabricating plant at Pottstown, Pa., and is planning to extend greatly, its capacity. One report states that the company plans an expenditure of about $1,000.000. The McClintic-Marshall Co. recently placed contracts for about 20 cranes and a large assortment of other machinery for the equipment of the new shop.

Victor De M. Upham, member of the firm of U. B. Upham & Bro., Brooklyn, manufacturers of rivets, died in Brooklyn recently, aged 83 years.

Battleships

Will Be Built by Government, if Congress Makes Appropriations

Washington, D. C., Nov. 23. (By wire.)—Asserting that the bids submitted last week by private builders for battleships 43 and 44 exceeded the limit of $7,800,000 set by congress, Secretary of the Navy Daniels today announced his intention to have both vessels built in government navy yards, if possible. Provided congress makes sufficient appropriations to enlarge the Mare Island, Cal., and Philadelphia yards, Daniels said they would build the vessels. With this purpose in view, the secretary directed that specifications be prepared and sent out at once for steel requirements for two ships, including 62,000,000 pounds of plates, shapes, rivets and castings.

This will be the first time in the history of the department that it has taken bids direct for this material from steel makers. Heretofore, when navy yards built craft for the government, estimates were submitted to them by steel makers, but owing to the congested condition of steel mills, Secretary Daniels fears that delivery of material will be delayed unless a contract assuring prompt shipments is given and consequently he has devised the innovation of seeking bids direct. While bids will go out to relatively few steel manufacturers, Secretary Daniels wants all who can to submit figures. He expects to open bids within a week. The award for armor plate for two vessels will not be made until the structural steel award is made.

Higher Pig Iron Prices

Pittsburgh, Nov. 24. (By wire.)—Foundry and malleable pig iron are being held at $17, valley, by all sellers in this district and some tonnage has been sold at that figure. Basic iron is being held at $17, but no sales above $16 are noted. Bessemer iron is selling at $17.50 and some dealers are asking $18, valley, for small lots.

Follows Business-Like Methods

The Industrial Corporation of Baltimore City, of which John R. Bland is president, is an organization which extends financial assistance to individuals, firms and corporations desiring to establish new manufacturing enterprises in Baltimore, or wishing to extend an industry already in existence by establishing a Baltimore branch. The corporation shows its solid, conservative character by insisting that its secretary, C. C. Pusey, U. S. F. and G. building, Baltimore, be furnished reliable data concerning the proposed enterprise. Reference as to character and experience of those interested must also be furnished and it is specifically stated that firms unwilling to submit the desired information, those unwilling to have books audited and those of a speculative character need not apply.

Will Not Buy

Pennsylvania Will Not Take Cars—Other Roads Order

New York, Nov. 24. (By wire.)—The Pennsylvania system has definitely decided not to buy freight cars on account of the prices quoted, as makers refused concessions. It is understood bids were made on a basis 1.50c to 1.60c steel. Orders have been placed, however, for about 150 cars for passenger equipment. Car orders are lighter this week, totaling less than 2,000. The Cincinnati, Indianapolis & Western has placed 660 freight cars with Haskell & Barker. The Interborough has ordered 311 coaches and 651 trucks. With the Pullman Co. the Katy increases its inquiry by 2,000 gondolas. The Duluth, Missabe & Northern wants 1,000 ore cars and 200 hoppers. The Duluth & Iron Range 750 ore cars and 2,000 hoppers. The Lackawanna road is still out for 1,000 box cars and 500 gondolas. The Delaware & Hudson wants 1,000 underframes.

Big Men

Are Connected With New Export Company —More Boats Awarded

New York, Nov. 24. (By wire.)—The American International Corporation, just incorporated with $50,000,000 capital, will include some leading business minds of this nation for the extension of foreign trade. The charter gives broad powers to engage in many lines of industry. Charles A. Stone, of Stone & Webster, Boston, is to be president and Frank Vanderlip, of the National City Bank, chairman. The directors include W. E. Corey, Charles A. Coffin, president of the General Electric Co., Ambrose Monell, president of the International Nickel Co., W. L. Saunders, president of the Ingersoll-Rand Co., and other prominent names.

Negotiations are under way for the acquirement of the Temple, Pa., furnace by H. H. Adams, New York, and associates. Albert Broden, general superintendent of blast furnaces of the Reading Iron Co., has resigned to become associated with company which will operate this furnace and carry out other plans.

Four more boats have been awarded eastern yards. The Cramp yard receives two tankers from the Mexican Petroleum Co., the New York Ship Building Co. one vessel for the Pocahontas Fuel Co. and an additional boat for the Coastwise Transportation Co.

Spelter Prices

For Prompt Delivery Considerably Higher —Lead is Quiet

New York, Nov. 23.—The metal markets have displayed a further marked upward tendency in prices during the week, and a large amount of business has been transacted in copper and spelter. Today, however, there is less activity. Copper producers are well sold ahead, mainly on account of large sales to foreign consumers. Electrolytic now is held at 20c, delivered 30 days, the best brands of casting copper at 19.75c to 19.87½c, cash, ordinary casting copper at 19.25c to 19.50c, cash, the best brands of lake copper at 20c, cash, and ordinary and arsenical lake copper at around 19.75c, cash.

Spelter continues exceedingly scarce for shipment over the remainder of this year so that prompt prices are considerably higher than futures. Much business, however, has been entered for first half shipment. Galvanizers, it appears, are going slow about placing future requirements. Prime western for spot and November shipment is quoted at 18.50c to 18.75c, St. Louis, December at 18.25c to 18.37½c, January at 17.37½c to 17.62½c, first quarter at 16.50c to 16.75c, and second quarter at 14.50c to 14.75c. Demand for brass special, which is quoted nominally at 20.50c to 21.50c, St. Louis, for prompt shipment, is improving.

The lead market is quiet but strong and independent producers are not anxious to book business due to the extent to which they are sold ahead. Some sales have been made by these interests at 5.27½c, New York, and 5.20c, St. Louis. The American Smelting & Refining Co. is asking 5.25c, New York, and 5.17½c, St. Louis.

Will Open Office in New York

The Buffalo Foundry & Machine Co., Buffalo, will on Dec. 1, open an office in New York City at 1432 Whitehall building, 17 Battery Place. The company manufactures vacuum and chemical apparatus, and also does a general jobbing foundry and machine business.

Coking Coal at Low Temperatures

EXPERIMENTAL INVESTIGATIONS of various types of Illinois coals, carried on by the authors as a part of chemical research work at the University of Illinois, have revealed a host of interesting and valuable constituents. The apparatus devised for coking coal at comparatively moderate temperatures is also worth study. The results of experiments with mixtures of semi-coke and raw coal are set forth in detail.

By S. W. Parr and H. L. Olin

THE formation of coke depends upon the presence of certain constituents having a melting point which is lower than the temperature at which decomposition or carbonization takes place. Oxidation of these compounds may easily take place and the greatest coking effect is obtained where the opportunity for the minimum amount of oxidation has occurred. The condition prescribed, therefore, is that there shall be the least possible exposure to oxidation either before or during the process of carbonization.

Coals containing an excessive quantity of the coking substance produce a light porous coke. The texture of the product may be modified by use of pressure and by close packing of the charge and especially by mixing with material which has already passed through the coking process. Such a mixture provides the physical conditions whereby the gases formed may readily pass out of the mass without carrying along the cementing substances. By use of temperatures between 400 degrees and 500 degrees Cent., all of the resulting products are of a type distinctly different from those obtained by the usual high temperature procedure.

The apparatus used in the experiments conducted by the authors is shown in Fig. 1. It consists of a boiler plate shell *A*, lined with asbestos to prevent excessive radiation of heat; within this, forming the coking chambers, is a shell *B* of the same material, containing a cone of light sheet iron *C*, perforated with 3/16-inch holes, designed to confine the coal charge and to allow a free circulation of gases. To obtain a non-oxidizing atmosphere, steam was admitted from the high pressure main *E*, passed through the coil *F* where it was superheated by the hot currents ascending from the gas-burner, and then conducted into the coking chamber. The heat was supplied by a blast ring burner *D*, connected with the gas and air mains, and no difficulty was experienced in producing the desired temperatures. The charge of crushed coal was fed into the hopper *G* and admitted to the retort through a large gate valve. The coked residue was removed, after cooling the apparatus, through the bottom at *H*. Gases of combustion escaped through the opening *J*, which was connected with a flue, while the distillates were conducted through an outlet pipe to a condenser consisting of several 4-foot

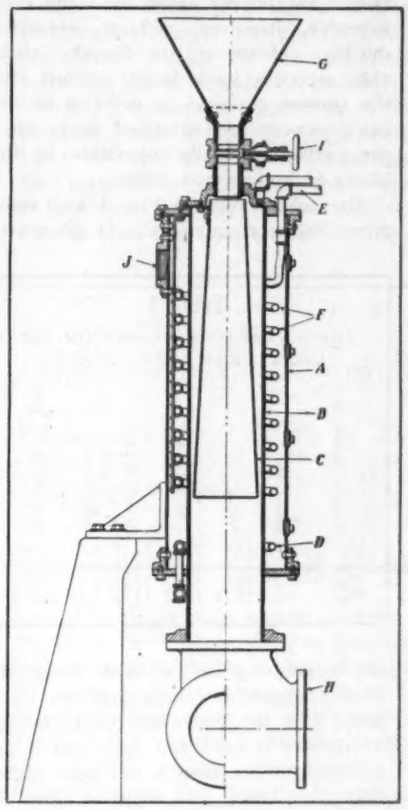

FIG. 1—CROSS SECTION OF APPARATUS FOR LOW TEMPERATURE DISTILLATION OF COAL

lengths of 1-inch pipe connected by return elbows. Cold water was allowed to drip over this gridiron-like contrivance. The tars were passed through a water-sealed exit at the bottom, while the gases, fairly clean, were collected in a gasometer.

Coking Tests

To study further the coking qualities of Illinois coals at temperatures ranging from 400 degrees Cent. to 500 degrees Cent., and to obtain a quantity of the coke residue sufficient in amount for practical tests, in order to determine its commercial value, a series of runs was made, using the apparatus described. Numerous coals from various Illinois fields were included in this set of experiments. In this article, however, products from representative types only are illustrated and described, since the results of tests of different coals of a given field showed little variation.

Of particular interest during the process of distillation was the behavior of the coals from northern districts, especially those from Vermilion county. As heating progressed, a black, pitchy substance dripped from the joints of the containing ovens, but it hardened immediately on cooling, forming a brittle mass, much resembling asphalt. This was undoubtedly the cementing principle which is instrumental in forming coke. According to Lewes, it consists of substances derived from the resins of the original coal sources, which melt at about 300 degrees Cent. and decompose at slightly higher temperatures, yielding liquid products which distil out as tar vapors and hydrocarbon gases, and a pitch residuum, which at 500 degrees Cent. forms a mass of coke. Lewes' general theory that these resinic substances are readily oxidizable and in their oxidized condition have much to do with coke formation, is borne out in these experiments by the fact that no weathered coal of any type produced the gummy exudation mentioned, although there was no apparent diminution in the amount of gases given off. Compared with the bituminous coals of the eastern states, those of Illinois are exceedingly rich in this resinous binding material. Even those from the southern districts of the state, while not as "fat" as those from Sangamon and Vermilion counties, nevertheless, much surpass in this respect coals like the Pocahontas, and those from Ohio and Pennsylvania. Strangely enough, the abundance of coking material which the western types possess is the cause of their inferiority in the matter of making dense, hard coke; for with the decomposition of the resinic bodies and the deposition of cementing carbon, occurs at the same time an evolution of large quantities of gases, which inflate the pasty mass and make the resulting coke more or less light and spongy. Indeed, certain Vermilion county coals, after being heated under conditions which allow free expansion, present the appearance of hardened froth, because of the excessive development of cell structure in the coke which has taken place. The porosity of the product may be

From a report covering a series of studies made during a period from 1911 to 1913, at the University of Illinois engineering experiment station, Urbana, Ill., as a continuation of previous researches covering the nature of coke by-products made by the authors. S. W. Parr is professor of applied chemistry and H. W. Olin is instructor in chemistry at the University of Illinois.

FIG. 2—VERMILION COUNTY COKE

appreciably reduced by subjecting the contents of the oven during the heating period to a considerable pressure. Another means to the same end which was recognized in earlier experiments and which has been applied in the latter series is the addition of inert coke dust to the raw coal as fed into the retort. This material, acting in the capacity of a "blotter", reduces the plasticity of the softened mass and allows the gases to escape freely without producing a blowing effect.

The diluting medium in the case of the specimens shown here was a mixture of various semi-cokes which had accumulated in the course of the work. The material was crushed and ground to a fineness of 40 or 50 mesh and thoroughly mixed with the rest of the charge in ball mills.

Analysis of Semi-Coke Breeze

An analysis of a composite sample of this semi-coke breeze gave the following results:

	Actual.	Dry.
Moisture	1.85	12.15
Ash	11.90	12.15
Volatile Matter	19.85	20.22
Sulphur	2.62	2.67
Fixed Carbon	66.40	67.65
Calorific Value (B. T. U.)	11,243	11,454

The effect of the addition of this foreign substance is exceedingly interesting. Certain types of coal, as, for instance, those from Vermilion county, produce hard, firm coke when mixed with as much as 100 per cent of their own

FIG. 3—SALINE COUNTY COKE

weight of the coke dust; those from the southern districts with higher fixed carbon do not need so great a dilution. Not only is the texture made firmer by this treatment, but the density is increased. Attention will be called to the differences in the properties of the cokes in discussing the individual samples.

Coke was made first from Vermilion county screenings. In order to remove dust, which may have been more or less weathered, the coal was passed over a ¼-inch screen.

The resulting coke, shown in Fig. 2, is extremely light and porous, with a specific gravity of only 0.650. Its texture is firm, notwithstanding the low temperature at which it was formed, and it has proved ability to stand considerable handling without excessive dusting. Moreover, its porosity probably accounts in a large measure for the success obtained in using it in the gas producer test described later, since the carbon is easily accessible to the blasts of hot air and steam.

The coke shown in Fig. 3 was made from Saline county coal. It illustrates

Table I

PERCENTAGE COMPOSITION OF COKE FROM RAW COALS

Sample Shown in	Moisture.	Ash.	Volatile Matter.	Fixed Carbon.	Sulphur.	Heat Value B. T. U.
Fig. 2	1.85	13.8	13.20	71.10	3.0	11,891
Fig. 3	1.20	11.9	10.85	75.95	1.6	12,520
Fig. 4	3.25	12.4	11.50	72.85	1.5	12,600
Fig. 5	2.25	11.75	12.30	73.70	1.55	12,415

the superiority of a coal from the southern field for coking purposes. Compared with the Vermilion county sample, its texture is hard and firm, and it has a density more than 6 per cent higher than the latter. It may be seen by referring to the photographs that the cellular structure of the Saline county sample is relatively close and solid, and bears little resemblance to the other.

One of the best products obtained in this series of experiments was from a coal from Williamson county. This sample, shown in Fig. 4, shows a fine, even grain and has a density of 0.750, more than 15 per cent higher than that shown in Fig. 2. It has remarkable strength, both tensile and compressive, and stands rough handling without appreciable dusting.

Several other coals from Williamson county have shown the good coking qualities which characterize the southern types. The sample illustrated in Fig. 5 shows an uncarbonized center, but its outer portion is consistently dense and hard, with considerable strength.

FIG. 4—WILLIAMSON COUNTY COKE

Tests were made of many coals from other localities, as well as from different beds in the same locality. Included in the list are samples from Perry, Franklin, Jefferson and Jackson counties, but the cokes made from them are so similar in quality to those already described that they are not separately discussed.

The effect of the addition of a fine inert diluting medium to different types of raw coal is seen in Fig. 6 and Fig. 7. The former is the product from the heating of a mixture of equal parts of Williamson county coal and the semi-coke breeze described above.

This coke is loose in texture and crumbles easily, showing a deficiency in bonding material. On the other hand, the coke shown in Fig. 7, made from equal parts of Vermilion county coal and the coke in question, is quite as hard and firm as the raw coal product and considerably denser. The coke shown in Fig. 8 is from Vermilion county coal diluted with one-half its weight of inert material, and while it resembles that of Fig. 7, it has a lower specific gravity than the latter specimen.

Williamson county coal, although unable to cement itself firmly when mixed with an equal weight of non-

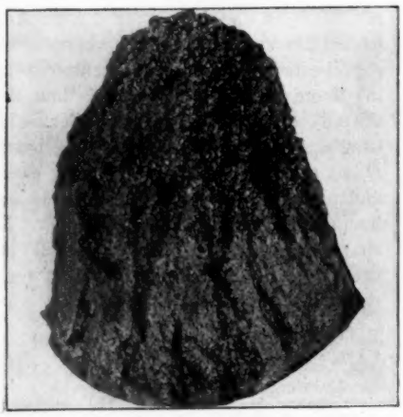

FIG. 5 — WILLIAMSON COUNTY WASHED NUT COKE

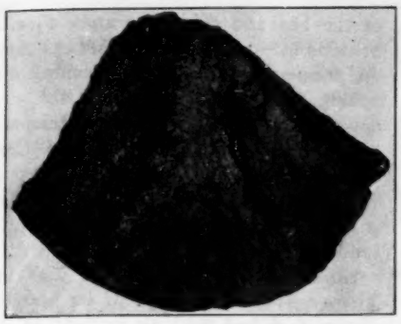

FIG. 6 — COKE FROM WILLIAMSON COUNTY COAL MIXED WITH COKE DUST

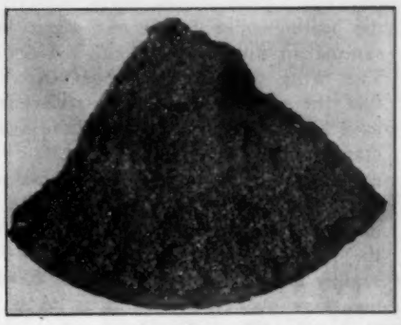

FIG. 7—COKE FROM EQUAL PARTS OF VERMILION COUNTY COAL AND COKE DUST

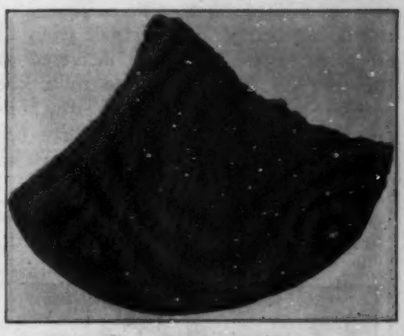

FIG. 8 — COKE FROM VERMILION COUNTY COAL MIXED WITH COKE DUST

coking material, nevertheless works successfully in a mixture of two parts coal to one part inert material. That shown in Fig. 9 is both coherent and dense, proving that the dilution limit has at least not been exceeded in applying this mixing ratio.

Saline county coal likewise produces better coke with the addition of foreign material. The coke illustrated in Fig. 10, two parts raw Saline county coal and one part coke dust, is superior in every way to the coke from the raw coal alone. The composition of this series of samples is given in Table II. The rise in the density of the coke with the addition of the inert substance is shown by the results of the following specific gravity measurements of the samples:

Shown in	Mixture.	Density.
Fig. 2	(Unmixed)	0.650
Fig. 3	(Unmixed)	0.687
Fig. 4	(Unmixed)	0.750
Fig. 7	(Raw ½, Dust ½)	0.852
Fig. 8	(Raw ⅔, Dust ⅓)	0.848
Fig. 9	(Raw ⅔, Dust ⅓)	0.868
Fig. 10	(Raw ⅔, Dust ⅓)	0.969

For purposes of comparison it is interesting to note that the coke shown in Fig. 11, a 16-hour Solvay coke from an Illinois coal, has a density of 0.830; Fig. 12, a 48-hour compressed charge, 0.986; while a representative sample of bee-hive Connellsville has a density of about 1.12.

While the methods described in the foregoing may not be applied directly on a commercial scale to operations for making metallurgical coke, still it is hoped that the results obtained may at least help to establish the characteristics of the coals of the state with regard to their adaptability to this use and to suggest methods and principles on which to work in solving the problem of making cokes of good quality from such material. Unquestionably they possess coking properties to a marked degree, but need to be treated differently from the eastern coals with their higher percentages of fixed carbon.

Table II

COMPOSITION OF COKES FROM MIXTURES OF COAL AND COKE DUST

Sample Shown in	Moisture.	Ash.	Volatile Matter.	Fixed Carbon.	Sulphur.	Heat Value B. T. U.
Fig. 6	1.30	12.9	13.90	71.90	2.50	12,295
Fig. 7	1.35	14.95	13.7	70.0	3.15	11,750
Fig. 8	1.60	14.50	12.70	71.20	2.9	11,825
Fig. 9	1.40	14.2	15.22	69.18	2.8	12,150
Fig. 10	1.45	15.4	10.50	72.65	3.0	11,920

Gas Producer Tests

Early in the course of this work, the study of the products resulting from distillation of bituminous coals at low temperatures suggested the possibility of using them as fuels for the gas producer, whereby it was hoped to obtain gases sufficiently free from tar to be suitable for use in the internal combustion engine.

Some previous experiments had shown that the moderate temperatures of the preliminary heating period were effective in expelling the major part of the tar-producing substances and that the residue, distilled a second time at high temperature, yielded gases remarkably free from condensation products. By means of the device already described a quantity of coke was prepared and it was fired in the usual manner. The fuel used was the semi-coke product obtained in subjecting Vermilion county screenings to low temperature distillation (400 degrees Cent. to 550 degrees Cent.). This test material, 400 or 500 pounds in weight, consisted of pieces varying in size from ¾-inch to 2 inches in diameter, but the charge as fired contained some dust. It was light and porous and lay on the fuel bed without showing much tendency to pack. Its composition was as shown in Table III. The producer used was a No. 3 Otto, designed to operate on anthracite pea coal, with a wet scrubber attached. The latter was merely a shell filled with coke, through which the gas, admitted at the bottom, passed counter to a stream of water flowing from the top. Using anthracite coal, the normal capacity of the producer was 4,500 cubic feet of gas per hour. In place of the gas engine, which under normal work-

FIG. 9 — COKE FROM WILLIAMSON COUNTY COAL AND COKE DUST

FIG. 10—COKE FROM SALINE COUNTY COAL AND COKE DUST

ing conditions draws the gas from the scrubber, a steam ejector delivered the mixture of steam and gas to a condenser and thence to a Westinghouse meter of the wet type, which had been calibrated just before the test was made.

Inasmuch as the supply of fuel was limited, the usual method of starting

FIG. 11—16-HOUR SOLVAY COKE

and stopping was varied somewhat. Before beginning the experimental part of the work, the producer was fired with anthracite and thoroughly warmed up. This fire was then drawn and a new one made with a weighed amount of wood and the fuel to be tested, and the operation continued until gas of a good quality was given off, when the test was declared begun. During this preliminary period, as in the rest of the run, the measured gas was sampled by means of the continuous sampler which is a part of the installation. At the close of the test, the fuel bed was burned as low as was deemed practicable, the ash pit cleaned, and the ash weighed and sampled. The residue on the grates was then drawn out, quenched, weighed and sampled.

After the test was started all the coal put into the producer was weighed. The total fuel charge used in the test then included the coal equivalent of the wood and coal used to start, plus the coal fired during the test, minus the coal equivalent of the carbon in the gas given off before the formal start, minus the coal equivalent of the residue in the fuel bed at the close.

Gas samples were drawn from a point beyond the ejector where the gas was under pressure, and were taken over mercury. Coal and ash samples were taken in the usual manner. Water fed into the vaporizer was weighed in a tank on scales. The weight of the overflow from the vaporizer was obtained in the same manner, and the weight of the water going into the fuel bed from this source was the difference between these two. All temperatures were taken with mercury thermometers with the exception of that of the gas at the producer outlet, which was obtained by means of a pyrometer.

An attempt was made to get tar samples just as the gas left the producer, but it was found that the amount of tar formed was not appreciable and the sampling was discontinued. The Junker calorimeter was used to obtain the heating value of the gas, about one sample an hour being taken for tests. The firing test for this sheet showed that the producer ran successfully and gave little trouble. Because of the small diameter of the fuel bed, resulting in considerable friction, the lightness of the material used, and its slight tendency to coke and arch, the fuel above the bed proper did not feed down as rapidly as it was burned. Hence it was necessary about once an hour to poke it down with a slice bar and in this respect it probably required a little more attention than a charge of anthracite.

It may be noted, however, that it was necessary to poke and clean the grates from the bottom, but once during the six hours of the trial. With so small a producer this indicates a remarkable freedom from ash and clinker trouble. On cleaning the fire small pieces of clinker were found in the ash, but there was none at all sticking to the sides, where it usually collects. The high grate efficiency, 98.2 per cent, also shows

Table III

ANALYSES OF PRODUCER TEST FUEL

Proximate Analysis

	Per Cent.
Moisture	2.28
Ash	15.82
Sulphur	3.13
Volatile Matter	18.00
Fixed Carbon	63.90
Calorific Value (B. T. U.)	11,601

Ultimate Analysis

	Per Cent.
Carbon	69.86
Hydrogen	2.76
Oxygen	5.15
Nitrogen (estimated)	1.00
Sulphur	3.13
Ash	15.82
Water	2.28

that the fires required little attention, since poking and cleaning invariably force much unburned carbon out into the ash.

The fact that the fire required so little attention has an added significance in connection with a producer having a small fuel bed, such as the one used in this test. Usually, the inrush of air, when the doors are opened for cleaning, dilutes the gases sufficiently to make them too lean to burn, but with the fuel in question less trouble was experienced in this respect than is usually the case with anthracite, for at no time did the pilot flame go out and there was no great variation in the calorimeter readings.

A study of the temperature of the gas leaving the producer throws considerable light on the condition of the fuel bed. If the bed becomes clinkered, or if holes form in the fire, air goes through without coming into intimate contact with the carbon. This chimney effect causes the gas to burn at the surface of the bed and the temperature to rise. Sometimes it is very difficult to keep the temperature down and cleaning and poking have little effect. In the case under discussion, however, the temperature never rose above 420 degrees Cent. except during the last 20 minutes of the test, when the fire was so low that it was essentially a furnace and not a producer.

No trouble was experienced with tar. There was little evidence of its presence in the fuel bed, and an attempt to get a sample of it from the gas leaving the producer showed that it was present in negligible quantities only. On cleaning the ejector at the close of the run a small amount of tar was noticed, but most of the deposit was of the nature of scale. It is to be remembered that before going to the ejector the gas had first passed through the scrubber.

The efficiencies, hot gas 74.4 per cent and cold gas 64.9 per cent, compare very favorably with those obtained in using anthracite coal of the same ash content. Data and results are given in Table IV.

A limited amount of the coke was available for testing its adaptability to house-heating purposes. Heavy hydrocarbons having been removed, the coke was clean both in handling and in burning. However, there remained approximately 20 per cent of volatile matter which entered into the process of combustion after the coke had attained a temperature at or beyond the point to which it had been subjected in the coking process. These conditions resulted in a free burning substance, yet one whose combustible constituents did not produce smoke in burning.

An open grate was selected as furnishing the best opportunity for observing the behavior of the material. The coke ignited readily and retained its shape through the process of combustion, a bed of glowing coals quickly resulting. The very indifferent provision for draft as found in an open grate was sufficient for keeping the

FIG. 12—48-HOUR COMPRESSED SOLVAY COKE

combustion lively. No smoke was produced, and fire was retained over a long period of time, the interior of the larger pieces holding the fire and continuing the combustion until all of the carbonaceous matter was consumed. While the temperature commonly attained by a grate fire would not furnish positive evidence as to the formation of

clinker, the indications so far as they went, were altogether favorable. A small amount of coke, tested by burning in a hot air furnace, apparently was as useful there as it was in the open grate. In 1912, not 20 years after the introduction of the by-product type of oven, 165,000,000 gallons of tar were produced in the United States, and two-thirds of this quantity, according to Perry, came from by-product coke plants. With the steady increase in by-product oven construction the tar refining industry will assume a proportionate importance.

Of the various fractions obtained in distilling the crude tar the most important are benzol and its homologues, used in the color industry and as paint and fat solvents; the carbolic oils, much in demand for disinfectants of various kinds; and the creosote and anthracene oils, of great importance in the preserving of wood. The pitch residue is used in roofing, paving and road-building, but in these fields it meets strong competition with the mineral bitumens and consequently does not find so ready a market as the other constituents named. But pitch makes up the greatest part of the crude tar aggregate, being in most cases considerably more than one-half. The bulk of the raw material therefore is in the form of high temperature condensation products and free carbon of relatively small value, while the supply of the lighter fractions is insufficient

Table IV—Results of Gas Producer Trial

Dimensions and Proportions

Grated area, square feet	1.666
Mean diameter of fuel bed, feet	1.545
Depth of fuel bed, feet	2.21
Area of fuel bed, square feet	1.877
Approximate width of air spaces in grate, inches	0.5
Area of air space, square feet	0.722
Ratio of air space to whole grate	0.433
Area of discharge pipe, square feet	0.165
Water heating surface in vaporizer, square feet	2.7

Average Pressures

Average corrected barometer reading, inches mercury	29.52
Draft in ash pit, inches water	0.45
Suction at producer outlet, inches water	0.88
Pressure at meters, inches water	3.69
Absolute pressure at meters, inches mercury	29.69
Vapor pressure at meters, inches mercury	1.9
Dry gas pressure at meters, inches water	27.79

Average Temperatures

	Degrees Cent.
At barometer	28.3
Of fire room	33.3
Of feed water entering vaporizer	23.4
Overflow from vaporizer	84.8
Of water entering scrubber	14.8
Of water leaving scrubber	45.7
Of gases leaving producer	378.0
Of gases leaving first scrubber	34.5
Of gases entering meters	38.2
Of gases entering meters (absolute)	311.2

Fuel

Weight of wood used in starting, pounds	9
Volume of gas given off before start of test, cu. ft.	2,238
Volume of standard gas given off before start of test, cubic feet	2,010
Weight of equivalent coal as fired, pounds	381
Percentage of moisture in coal	2.28
Total weight of dry coal fired, pounds	372
Total ash and refuse, pounds	37
Total weight of residual, pounds	49
Total weight of combustible, pounds	280.6

Composition of Producer Fuel

	Per Cent.
Fixed Carbon	70.77
Volatile matter	18.00
Moisture	2.28
Ash	15.82
Sulphur, separately determined	3.13

Ultimate Composition of Producer Fuel

	Per Cent.
Carbon	71.50
Hydrogen	2.82
Oxygen	5.26
Nitrogen	1.02
Sulphur	3.20
Ash	16.20
Moisture in sample coal as received	2.28

Composition of Dry Ash and Refuse

	Per Cent.
Carbon	14.48
Earthy matter	85.52

Composition of Residual Fuel on Grate

	Per Cent.
Carbon	36.46
Volatile matter	7.10
Moisture	1.18
Ash	55.30

Fuel Consumption Per Hour

	Pounds Per Hour.
Dry coal	58.8
Dry coal per square foot of grate area	35.3
Dry coal per square foot of fuel bed	31.3

Calorific Value of Fuel

Calorific value by oxygen calorimeter, per pound dry coal, B. T. U.	11,601

Water

	Pounds.
Total weight fed to vaporizer	440.0
Total weight of overflow	256.0
Water actually evaporated in vaporizer	184.0
Weight of water fed to producer—	
From vaporizer	184.0
In air (estimated)	6.0
In coal	8.7
Total	199
Total weight of water decomposed as used in calculations	91.0
Total weight of moisture in gas leaving producer	108.0
Weight of water decomposed per pound of gas generated	0.0588
Weight of water decomposed per pound of dry coal fired	2.42
Total weight of scrubber water	5,880

Gas

Calorific value per cubic foot of standard gas from calorimeter, B. T. U. (high value)	121
Specific weight of standard gas, pounds per cubic foot	0.0670
Specific heat of dry gas leaving producer (estimated) degrees Cent.	0.260
Total volume of gas from meters, cubic feet	26,927
Total volume of standard gas at 16.5 degrees Cent. and 30 inches, cubic feet	23,150
Volume of standard gas per hour, cubic feet	3,660
Volume of standard gas per pound of dry coal, cubic feet	62.3
Total weight of standard gas, pounds	1,552.
Weight of standard gas per pound of dry coal, pounds	4.17

Composition of Gas by Volume

	Per Cent.
Carbon dioxide	4.15
Carbon monoxide	21.10
Oxygen	0.30
Hydrogen (estimated from calorific value)	11.80
Marsh gas	1.50
Nitrogen, by difference	61.00

Composition of Gas by Weight

	Per Cent.
Carbon dioxide	7.19
Carbon monoxide	23.17
Oxygen	0.38
Hydrogen	0.93
Marsh gas	0.96
Nitrogen, by difference	67.37

Efficiency

	Per Cent.
Grate efficiency	98.2
Hot gas efficiency, based on high heating value	74.4
Cold gas efficiency, based on low heating value	64.9

to meet the demand. This is especially true of those compounds of the tar which have bactericidal properties. With the rapid depletion of the forests and the cutting off of lumber supplies, wood preserving treatment has become imperative in many industries—particularly that of the railroads—and the lack of available material for this process is causing much concern. American supplies are inadequate for home consumption, and nearly 45,000,000 gallons of creosote oils were imported from Europe in 1911. Any modification of the coking process, therefore, that will increase the yield of the light tars by preventing their condensation to compounds of high molecular weight will effect a considerable economy. Consideration of this kind have lent interest to the study of the tars obtained in the course of these experiments, in which temperatures were kept much below those of the gas retort and the commercial coke oven.

In the present investigation the tar used was obtained in a separate series of runs made with Vermilion county coal.

To prevent oxidation and evaporation the tar was protected with a water seal as soon as formed, and kept in airtight cans until used for analysis.

The tar was fluid at temperatures considerably below room conditions. In appearance it was black to rich brown with varying thickness of layer, possessing an exceedingly disagreeable odor, even when judged by coal tar standards. The specific gravity measured with a pyknometer at 20 degrees was 1.069. Its low density made its separation from water by gravity somewhat difficult a tendency appearing for high fractions to float on the surface of the water. Its viscosity was low, and in this respect it resembled a mineral oil rather than a high temperature coal tar.

The percentage of free carbon, or more accurately, of substances insoluble in toluene and benzene, was found by treating a comparatively large sample of the dry tar, about 36 grams, with toluene, and heating the mixture on the steam bath. The solution was decanted through two filter cones. After three treatments the whole mass was transferred to the cones and extracted with benzine until the filtrate was colorless. Check results showed a free carbon content of 1.35 per cent.

In order to dry the tar, a preliminary distillation of 125 degrees was made and the light oil runnings, after being separated from the water, were returned to the retort. The apparatus used was an ordinary Jena distilling flask attached to a Liebig condenser.

In the earlier attempts to make this separation much trouble was caused by the tendency of the water in the crude material to produce a succession of "bumpings", often so sudden and violent as to throw a considerable part of the charge out of the retort. This annoying feature was prevented, however, by running a slow stream of air through a tube extending nearly to the bottom of the vessel, and later, in order to prevent oxidation which seemed to take place at the higher temperatures under these conditions, carbon dioxide, which had been previously washed and dried, was substituted. This method was used in all subsequent distillations of the crude, wet tar, and served the double purpose of providing an inert atmosphere in which to carry on the heating of the substances making up the material, many of which show remarkable chemical activity; and of making the boiling proceed smoothly and quietly. It is to be noted, however, that the current of gas sent through the apparatus carries over with it a considerable quantity of material whose boiling point is at a temperature above that maintained in the retort. In redistilling the dry tar to fractionate the sample, this precautionary measure was unnecessary, and therefore was not taken.

Methods of Recovery

The escape of the first light oil runings was prevented by surrounding the receiving vessel with a freezing mixture. To condense the heavier part of the second fraction, only the inner tube of the condenser was used, so that heat might be applied to facilitate the flow of the viscous fluid. To insure greater accuracy, a subsequent redistillation of the light oil fraction was made, it being possible to secure fractions with sharply defined boiling points, an important prerequisite to identifying individual compounds. The results were as follows:

Fraction.	Temperature Range. Degrees Cent.	Percentage.
Light oil	Below 210	17.2
Heavy oil	210-325	52.7
Pitch	Above 325	30.1

The low boiling fraction, purified as indicated above, is a clear amber-colored liquid with a disagreeable odor. It is very susceptible to the action of light and air and finally turns dark red, even when sealed in an atmosphere of carbon dioxide.

The separation and identification of all the individual constituents of a substance like coal tar is a great task. Lunge has described more than 200 distinct compounds which occur in tars of different qualities, and his list is probably not complete. We are concerned merely with a few of the most important substances, which are of interest because of their practical value, and not with those which are of interest from the scientific standpoint only.

The phenols and other acid substances of the light oil were separated from the neutral and basic constituents by shaking the fraction in a separatory funnel with half its volume of 10 per cent caustic soda solution. After this treatment had been repeated until no further reduction in volume of the residue took place, this caustic solution was drawn off and acidified with sulphuric acid, and the whole extracted with ether. The ether extract, when evaporated down, yielded crude phenol and its homologues.

The amines were removed from the oily residue after the phenol extraction, by shaking it with dilute sulphuric acid, of a specific gravity of 1.15, with warming. The solution was separated as before, neutralized with caustic soda, and the bases extracted with ether.

The method for separating paraffins and benzenes is based upon the familiar principle that the hydrocarbons of the paraffin series are practically inert toward sulphuric acid, while those of the aromatic series react with comparative ease, forming sulphonic acids, in which sulpho groups replace hydrogen of the benzene ring. These acids are very soluble in water and are, therefore, easily separated from the insoluble oily paraffin residues. Ten cubic centimeters of the fraction to be tested were measured into a milk bottle. To this was added 40 cubic centimeters of 37 N sulphuric acid, made by adding the calculated amount of fuming sulphuric acid to the ordinary acid of a specific gravity of 1.84, 10 cubic centimeters at a time. The mixture, after being kept at 100 degrees Cent. for an hour, was cooled and then whirled for five minutes in a separator. The volume of the unsulphonated or paraffin residue was read off directly. Equally good results are obtained, however, by pouring the mixture into a large volume of water and separating it by means of the funnel.

As a step toward identifying those constituents which do not react with acids and bases, a sample of the oil from which the phenols and pyridines had been removed, but which had not been sulphonated, was subjected to a second redistillation, with the measurement of the volumes going over between comparatively narrow limits of temperature. A summary of the results obtained is as follows:

Fraction.	Percentage on Basis of Crude Tar.	Percentage on Basis of Light Oil Fraction.
Light oil	17.2	100.0
Phenols (and other acids)	5.7	33.0
Amines (and other bases)	0.9	5.3
Paraffins	3.12	18.1

Specific gravity 0.966

The results of the refractionation of the light oil from which the acids and

bases had been removed are as shown in the table which is as follows:

Fraction in Degrees Cent.	Percentage on Basis of Light Oil Fraction.	Percentage on Basis of Crude Tar.
20-75 low boiling bodies.....	5.26	0.25
75-95 crude benzol (90 per cent)	2.10	0.38
95-125 crude toluol.....	7.36	1.33
125-170 crude solvent naphtha..	26.30	4.77
170-200 crude heavy naphtha...	14.73	2.67
200-210 crude heavy naphtha...	7.30	1.32

Fraction 1, besides some benzene, contains also pentanes and hexanes of the paraffin series, ranging in boiling point from 31 degrees Cent. to 64 degrees Cent. No. 2 includes some of the heptanes boiling in the nineties; No. 3, according to tables compiled from data obtained by distilling known mixtures, consists of benzene and toluene, the latter predominating, while fraction No. 4 includes the xylenes boiling from 138 degrees Cent. to 143 degrees Cent., with perhaps some mesitylene, boiling point 164 degrees Cent. Likewise the part reported as phenols contains besides, one or all of the three cresols, although the close range of boiling points, 190, 201 and 202 degrees Cent., made a quantitative fractionation of the crude extract impracticable. Finally, the rapid darkening of both the neutral and the active fractions on even short time exposures to air, points to the presence of various unsaturated substances, difficult to isolate and probably of no great practical importance. The heavy oil obtained from the first distillation, to which was added the residue boiling above 210 degrees Cent., from the redistillation of the light oil, is a thick viscous liquid of a rich brown color. After standing for a time, a non-crystalline sediment is formed.

Tar acids were determined by the methods used in the examination of the light oils, except that after the addition of the caustic soda it was necessary to warm the mixture in order to facilitate the separation, while the paraffin and aromatic content of substances was found by sulphonation as before. Likewise a sample from which the acid constituents had been removed was refractionated and the volumes of distillate given off between close temperature limits were noted. The napthalene content was determined by cooling, with a freezing mixture, the heavy oil sample from which the acids had been extracted, in order to crystallize out any of this substance which might be present. The test gave zero results; the conclusion is that no napthalene was present. This result is confirmed by observations made when the original tar was distilled from the coal, for at no time did the tar condenser become clogged as it would if napthalene were going over even in small quantities, nor did the pungent odor of its vapors ever become noticeable. To determine the amount of anthracene, the sample, dissolved in boiling glacial acetic acid, was treated with chromic acid slowly dropped through a reflux condenser to oxidize any anthracene present to anthraquinone. The results showed that the amount present was negligible. They were as follows:

Fraction.	Percentage on Basis of Crude Tar.	Percentage on Basis of Heavy Oil Fraction.
Heavy oil 52.7		100.0
Tar acids 22.2		42.13
Paraffins 6.2		32.66
Naphthalene 0.0		0.0
Anthracene 0.0		0.0

Specific gravity 1.032

Distillation of the acid-free samples gave the following results:

Fraction Degrees Cent.	Percentage on Basis of Crude Tar.	Percentage on Basis of Heavy Oil Fraction.
210 to 250.....	2.87	10.3
250 to 270.....	13.55	48.5
270 to pitch.....	11.53	41.2

In attempting to identify the various substances of the heavy oil fraction, the worker finds the problem even more difficult than in the case of the light oil, because the higher boiling points and molecular weights of the compounds make them more difficult to separate. A partial purification of the acid-bearing extract of this part of the tar showed by the boiling points that a high percentage of creosols was present. The higher boiling members were not identified. It is possible that they are polyhydric phenols, such as Lewes mentions as being present in the tar from coalite, and which he says form resinous masses difficult to investigate. Fraction No. 2 is the neutral part of the cut in tar distilling known as creosote oils. The residuum from the original distillation of the crude tar is a hard, black substance, rather brittle, breaking with a bright fracture. As indicated by the table of its properties, it is a hard pitch, as contrasted with soft pitch having a melting point of about 75 degrees Cent., its fraction, above 325 degrees Cent., being as follows:

Per cent on basis of crude tar.....	30.1
Melting point, degrees Cent.....	110
Specific gravity	1.27
Free carbon, per cent.....	12

In the publication of the results of the preliminary studies of low-temperature tar, attention was called to the fact that both the light and the heavy fractions were readily oxidizable, and the question was raised whether these oils might not serve as drying bodies or paint vehicles by forming coatings or films on oxidation. In an attempt to approximate a quantitative measurement of this capacity for absorbing oxygen, a series of iodine absorption determinations was made, with rather variable results. Further investigations of the kind have proved what was conceded as a probability at the time, that other reactions than those of simple saturation take place, chief among which is substitution with the formation of hydriodic acid. While fairly consistent results have been obtained in the supplementary work under strictly standard conditions, slight changes in the concentration of the iodine solution, in the time of digestion, and particularly in the temperatures of the reacting substances so varied the values found, that the method is deemed unreliable. Bromine is even more uncertain. Among the substances present in the tar from which hydrogen is easily displaced by the halogens are the phenols, the reaction taking place almost immediately, even in the cold.

The only reliable criterion of tar's value as a paint drier is perhaps the actual test of its behavior when exposed to air. The light oil fraction forms a thin film when spread on a glass plate inclined at 45 degrees. Using good linseed oil as a standard for reference, it is found that the tar oil films are decidedly thinner, that is, the oil flows more before thickening, and that the time of maximum drying is from two to three times that observed in the case of the linseed oil.

A small sample of the crude tar remaining after the conclusion of the work described was sent to the laboratory of a large roofing manufacturer for examination. The director of this laboratory, in a communication commenting on it briefly, says: "This tar in its characteristics resembles somewhat the Scotch blast furnace tars, although it is higher in tar acid content than the Scotch tars, and apparently not quite so high in paraffin-like bodies. The most interesting feature to us is its exceptionally high content of oxygenized compounds of phenoloid character. Should tar of this nature become a commercial product, it would undoubtedly have a certain value to the tar distillers, although it would, of course, have to be handled in an entirely different manner from the ordinary coal tars."

The outline of this laboratory's results is given in the following table:

Water, per cent.....	21.7
Tests on Dry Tar:	
Specific gravity at 15.5 degrees Cent...	1.072
Free carbon, per cent.....	1.3
Light Oil (to 210 degrees) per cent by vol.	15.2
Heavy Oil (to pitch) per cent by vol..	40.2
Light Oil:	
Tar acids, per cent.....	30.0
Sulphonation residue, per cent.....	15.0
Heavy Oil:	
Standard retort distillation:	
Total per cent to 170 degrees Cent...	0.5
200 degrees Cent...	2.0
210 degrees Cent...	6.6
235 degrees Cent...	33.6
270 degrees Cent...	61.0
315 degrees Cent...	65.8
355 degrees Cent...	94.9
Tar acids in total distillation.....	50.0
Sulphonation residues on fractions, per cent	4-5
Pitch:	
Free carbon, per cent.....	9.0
Melting point, degrees Cent.....	76

Of equal interest is the supplementary report furnished by a well-known creo-

soting company, on a sample of a tar similar to the one that has been discussed. "This tar is quite different from ordinary coal tar, in that it is thinner, has a lower specific gravity and much smaller percentage of pitch. The principal difference, however, is in the high percentage of tar acids and in the presence of considerable quantities of paraffinoid bodies. These differences probably would make it necessary to work this tar somewhat differently from the method employed for ordinary tars, but undoubtedly it would have considerable commercial value.

"The quantity at our disposal was so small that we were unable to separate an amount large enough to test the preservative qualities of that proportion which would be used for this purpose. Apparently, however, this tar would produce from 30 to 40 per cent of oil of fair preservative value. The high percentage of tar acids would make it a valuable source of material for the manufacture of antiseptic solutions, sheep dip, etc. The pitch contains a small proportion of free carbon and probably could be used for roofing purposes and paving filler."

It may be concluded that coke of good density and hardness can be made by mixtures of semi-coke and raw coal, if both are finely divided and evenly mixed. A variation is noticeable in the quantity of such non-coking material incorporated with different coals. For example, fresh coal from Vermilion county, Illinois, will carry such an addition of 100 per cent of its weight to advantage. Coals from Saline and Williamson counties give coke of the highest density when mixed in the proportion of 50 per cent of their weight with semi-coke.

Does Not Clog Producer

The coke resulting from the low temperature process has from 18 to 22 per cent of volatile matter remaining, but since it has been heated above 400 degrees there should be none of the tar constituents remaining. The most convincing test on this point as also the best method of arriving at a conclusion as to its adaptability for such work was to try out the material in a suction gas producer. The results indicated that no clogging effect whatever results, thus showing the absence of tar bodies. The physical operation of the producer as well as the grade of the gas produced was fully equal, if not superior, to the performance of the outfit when anthracite was used.

The semi-coke has such an amount of volatile matter remaining, together with the right degree of coherence as to make it especially well adapted to household use.

Semi-coke is clean to handle, free from dust, and burns without smoke or the formation of soot. Especially to be noted in this connection is its ability to retain a fire without undue attention as to drafts, and other requirements. The average specific gravity of the tar is 1.069. It is rich in low boiling distillate passing over at 210 degrees. This product averages 18 per cent of the total. The pitch residue amounts to approximately 30 per cent and is remarkably free from precipitated carbon.

The adaptability of the tar for wood preservation processes seems to be indicated by the high percentage of tar acids. These constituents make up from 28 to 30 per cent of the crude material. The larger part, about 22 per cent, is found in the second distillate, only about 7 per cent coming over below 210 degrees.

Approximately 10 per cent of the crude tar is found to be low boiling distillate free from the tar acids and suitable for use in internal combustion engines.

Naphthalene is absent. The free carbon in the crude tar is less than 2 per cent, and the residual product after the light distillate and heavy oils are removed would be classed as hard pitch.

A principal feature results from this study of these various substances, namely, that all three of the general divisions of coke, tar, and gas have specific properties of an especially valuable sort which would indicate that the process of coking at low temperatures could be established on a commercial basis.

Rail Failures Show Decrease Since 1908

By M. H. Wickhorst

STATISTICS of rail failures for the year ending Oct. 31, 1914, were furnished by various railroads of the United States in response to a circular sent out by the American Railway Association. The information furnished by each railroad showed the number of tons laid of each year's rolling from each mill and the total number of failures that occurred in each year's rolling from the date laid until Oct. 31, 1914. The failures were divided into four classes, namely, head, web, base and "broken". The reports cover rollings for 1909 and succeeding years, and the ages of the rollings would average in the track about as follows:

1909	5 years
1910	4 years
1911	3 years
1912	2 years
1913	1 year
1914	Several mos.

One important purpose of these records is to show which rollings were defective; and as most of the badly defective rails cause failures within a few years after being laid in track, the record was closed with a rail age of five years. The tonnage of rail represented by the statistics in this report are as follows:

Year rolled.	Bessemer.	Open hearth.	Total.
1909	421,210	514,302	935,512
1910	559,708	842,895	1,402,603
1911	233,270	630,694	863,954
1912	95,666	997,078	1,092,744
1913	72,496	1,202,060	1,274,556
1914	20,779	672,564	693,343

The failures were tabulated with reference particularly to the performance of the rails made by the different mills and were classified successively in the following order: kind of steel (bessemer or open hearth), mill, year rolled, weight per yard, section and railroad. The totals were figured for the groups by year rolled. Lots of less than 1,000 tons in any one year's rolling, were excluded from the tabulation as being unnecessary. Figuring the number of failures per 10,000 tons of open hearth rails as 100 for each of the years 1909, 1910, 1911 and 1912, the relative number of failures of bessemer rails, with the failures per 10,000 tons, is as follows:

Year rolled.	Years service.	Failures per 10,000 tons: Open hearth.	Failures per 10,000 tons: Bessemer.	Comparative failures: Open hearth.	Comparative failures: Bessemer.
1909	5	141.7	268.7	100	190
1910	4	76.3	158.5	100	208
1911	3	58.8	113.4	100	193
1912	2	20.1	44.4	100	221

It is interesting to note that the failures per 10,000 tons of bessemer rails were about two times those of open hearth rails. The 1909 rails showed as a general average for all mills a lower rate of failures than the 1908 rails, and it is gratifying to note that the later rollings show a tendency toward continued improvement as a general average. A comparison with last year's statistics indicates, as a general average of all the mills, a gradual decrease in the rate of rail failures of rollings for the successive years since 1908, with which year's rolling the records of rail failures were initiated.

From a report made to the American Railway Engineering Association. The author is engineer of tests, rail committee.

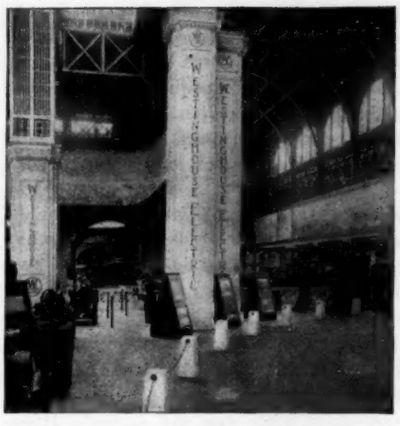

Exhibit Attracts Interest

The exhibit at the Panama-Pacific exposition of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has attracted considerable attention, due to its completeness and educational value. It includes displays from electric locomotives to a small 6-volt battery. At the top of this page is a general view showing the reception room and display of line material. At the left is shown a corner devoted to battery charging, gasoline and electric automobile equipment. The electric locomotive at the right is mounted on an electric turntable, which revolves once in every 3½ minutes. Below is shown a general view of the exhibit.

Successful Aluminum Die Casting

OWING TO the high metal cost which is so vital a factor in the die casting industry, it is necessary that the cost of a die casting in other metals than iron must be less than the combined cost of producing the same casting in iron and machining it to a finished product. Mr. Pack describes a modern process producing a die casting from an aluminum-copper alloy which has been commercially developed on a large scale.

By Charles Pack

THE past year, with its unparalleled conditions, has forced the die casting industry to fight for existence. None of the die casting alloys in general use exceed cast iron in tensile strength. It can therefore be seen that the foundation of the die casting industry must be based on economy. The cost of any die casting must be less than the combined cost of producing that casting in iron and of machining it to a finished product, equivalent to a die casting. It will be readily seen that the cost of metal is a vital factor to the life of the die casting industry, since prohibitive prices for raw materials would exclude die casting from competition with other methods of production. The zinc market may serve as a good illustration. Approximately 85 per cent of the die castings produced in 1914 were made from zinc alloys consisting of a minimum of 85 per cent zinc, the other elements being tin and copper, which, having a higher market value, would tend to raise the net cost of the average zinc die casting alloy to approximately 5c per pound above the market price of zinc. For example, with zinc at 7c, copper at 16c, and tin at 40c, which prices are about the average, the cost of the average die casting alloy is 12c per pound. This means that in order to compete with sand casting, the die casting process must show a minimum saving of about 9c per pound on the machining cost of the casting, since the cost of cast iron does not exceed 3c per pound. The cost of intermediate brand zinc on June 1, 1915, was 28c per pound, which would bring the cost of the average die casting alloy to 31c per pound. What this high metal cost means to the die casting industry can readily be understood by considering that in order to compete, a three-pound die casting must show a net saving on its machining cost, of at least 84c. Although there are numerous instances where die castings show a saving, even at this high market, the growth of the industry must of necessity be curtailed if such conditions are to prevail, unless a substitute for zinc is to be found. A careful study of the properties of the common metallic elements reveals aluminum as the hope of the die casting industry. The normal price of aluminum before the war was 8c, which, considering its specific gravity, makes it the cheapest non-ferrous metal obtainable.

At present it is over 50c, but even at such a figure it is not surprising that die casting manufacturers should make a desperate attempt to produce aluminum die castings commercially.

Many False Claims

It has been claimed at various times that aluminum die castings were being produced in France and Germany. The writer personally investigated the claims of one individual who had just come from France, where he had discovered the "secret process" for die casting such parts as automobile crank cases, transmission gears and, in fact, any part from the size of a pin to the size of a large writing desk. This claim, as well as many others, was discovered to be without foundation; and the writer has generally found that the term "die casting" was misconstrued. The practice of inserting iron parts in a sand mold at certain points, to save machining, is not new; but it by no means constitutes die casting, which is understood to be the process of pouring molten metal, under pressure, into a permanent *metallic mold* producing castings requiring little or no machining before assembling. That die casting is an individual industry, which was originated in this country, is proved by the fact that licenses under a process, patented by H. H. Doehler, were sold in England, Germany, Austria-Hungary, France and Canada. The writer, after a careful investigation of the subject, including the inspection of many samples of so-called aluminum die castings, does not hesitate to say that the commercial aluminum die casting is an American achievement. The Doehler process has been in operation for more than two years, during which time castings have been turned out for use on many of the high-priced automobiles and other machines. At the present time about 150,000 pounds of aluminum is being converted into die castings each month. The spark lever, throttle lever, spark and throttle sector on many automobiles are aluminum die cast by this process.

The alloy used in this process is strictly aluminum-copper, which does not contain any tin, zinc or cadmium. While on the subject of aluminum alloys for die castings, the writer would like to point out a peculiar experience, which will be of particular interest to those called upon to investigate metallurgical problems. In the course of experimenting upon aluminum alloys, about four years ago, the writer compounded an alloy consisting of equal parts of zinc and aluminum. The finest grade of zinc obtainable was used for this experiment, as well as primary domestic aluminum. The alloy was poured into ingot molds, 2 inches wide, 1½ inches thick and 10 inches long. In the course of about two years the ingot began to crack and warp. Upon further exposure the cracks penetrated through the entire thickness of the ingot in a most peculiar manner.

A short time ago the writer's attention was called to what was supposed to be an aluminum die casting. The part had undoubtedly been die cast, but the alloy appeared entirely too dark and heavy for aluminum. Having decided to analyze the sample, the writer took some filings from it, placed them in a beaker and added a little distilled water preparatory to the addition of the solvent acids. The writer was impressed with the violence of the reaction formed by the mere addition of pure distilled water, which reaction was very much similar to that obtained by the addition of weak acids to commercial zinc. Upon boiling with pure distilled water more than three-fourths of the alloy was dissolved and only a black powder remained at the bottom of the beaker, showing that the alloy was entirely decomposed by distilled water. Analysis showed the alloy to consist of an approximate even mixture of zinc and aluminum with the

(*Continued on page* 1060b.)

A paper read at the September meeting of the Institute of Metals, Atlantic City, N. J.

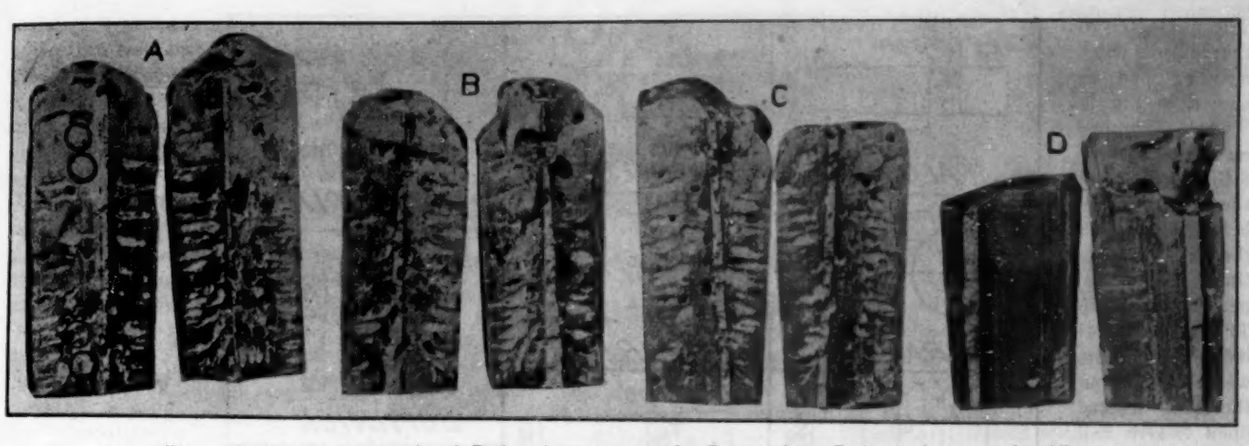

Fig. 1—Ladle test ingots. *A* and *B* show ingots as poured. *C* was taken off the steel as poured, while *D* had ferro-silicon added to it.

Unsoundness in Ladle Test Ingots

OWING TO the fact that these test ingots are subject to the same frailties as are larger ingots, the difference being only one of degree, analyses of the same ingot by different chemists are apt to vary. Mr. Hunt, as a result of long experience, advocates the addition of aluminum to the ladle, in order to prevent segregation without disturbing the carbon content of the specimen. The importance of soundness is emphasized.

By Robert W. Hunt

A RECENT order for the inspection of open hearth steel rails was of such a character as to demand a check for the manufacturer's chemical analysis of each heat represented, and the results of the subsequent analyses differed so widely from those reported by the mill that it was finally deemed advisable to make some investigation of matters pertaining to ladle test ingots, and principally to the possibilities of their segregation and soundness. Appreciating the importance of the subject, the author herewith presents some of the facts recorded, with a view of enabling rail investigators to take such steps as are practical to afford relief from present difficulties.

Table I---Analyses of Open Hearth Test Ingots

Analysis on drilling from:	Carbon.	Phosphorus.	Manganese.	Sulphur.	Silicon.
Mill ladle test ingot	0.71	0.012	0.81	0.030	0.079
Inside top of No. 1 (as indicated by circles)	0.71	0.021	....	.....	.....
Inside bottom of No. 1 (as indicated by circles)	0.659	0.018	....	.....	.....
Outside top of No. 1	0.64	0.016	....	.....	.....
Outside bottom of No. 1	0.637	0.017	....	.....	.....
Outside bottom of No. 2	0.63	0.018	....	.....	.....
Outside bottom of No. 3	0.636	0.018	....	.....	.....
Outside bottom of No. 4	0.64	0.019	....	.....	0.42

What has been known to exist for a long time became apparent at the outset of this investigation, this being simply, that ladle test ingots were subject to unsoundness and segregation exactly as are all large ingots, the only difference being one of degree. Obviously as long as this condition exists, it is manifestly impossible to expect analyses of the same test ingot by different chemists to agree within the limits of possible chemical error, unless drillings for the samples are taken with special care and mixed and divided so as to insure both chemists working on identical lots. But of much greater importance is the fact that when the ladle test ingot is segregated and unsound, the drillings taken from it may not be representative of the steel or heat as a whole, the reported results being therefore misleading and inaccurate. Thus a heat of steel can be reported as 0.60 per cent for carbon, while as a matter of fact, it was actually 0.75 per cent; and vice versa, it might be reported as 0.75 per cent and really be 0.60 per cent. These figures are not exaggerations, but are the differences reported by two chemists on drillings from the same test ingot. This subject is not a new one. Recently a committee of the United States Steel Corporation has made a considerable study of ladle test ingots, which has resulted in prescribing certain conditions for the guidance of its mills. The American Society for Testing Materials has a committee, at the present time, co-operating with the government bureau of standards in an investigation relating to ladle test ingots. Notwithstanding such steps as have been taken the author feels that certain fundamental facts are already established, and if the consistent adoption of practice based on these facts could be attained by immediate action a great benefit would be accomplished. At the mill at which investigations were made, the ladle test ingot mold was about 2½ inches square at the bottom and 5 inches high. Depending on the amount of steel poured into it and the extent of its boiling, or the raising up of the top, the resulting ingots varied in height from 3 to 6 inches. When they were drilled, in order to obtain the sample for analysis, many cavities were encountered. In some instances it became necessary to take drillings from two different locations on the same ingot, and in such cases the chemical results varied by as much as 0.15 per cent carbon by combustion.

A report submitted to the American Railway Engineering Association.

The character of these ingots when split open is shown in Fig. 1. Some chemical results on sample drillings from them are given below, although the difference in these cases happens to be small. These samples of ladle test ingots were taken from the same heat of open hearth rail steel and split open to show the interior structure. *A* was obtained from the second large ingot cast. *B* was secured from the sixth large ingot cast. *C* was selected from the thirteenth and last large ingot cast. *D* was obtained from the thirteenth large ingot cast, but had ferro-silicon added to it as it was being cast. Analyses of the test ingots were as shown in Table I.

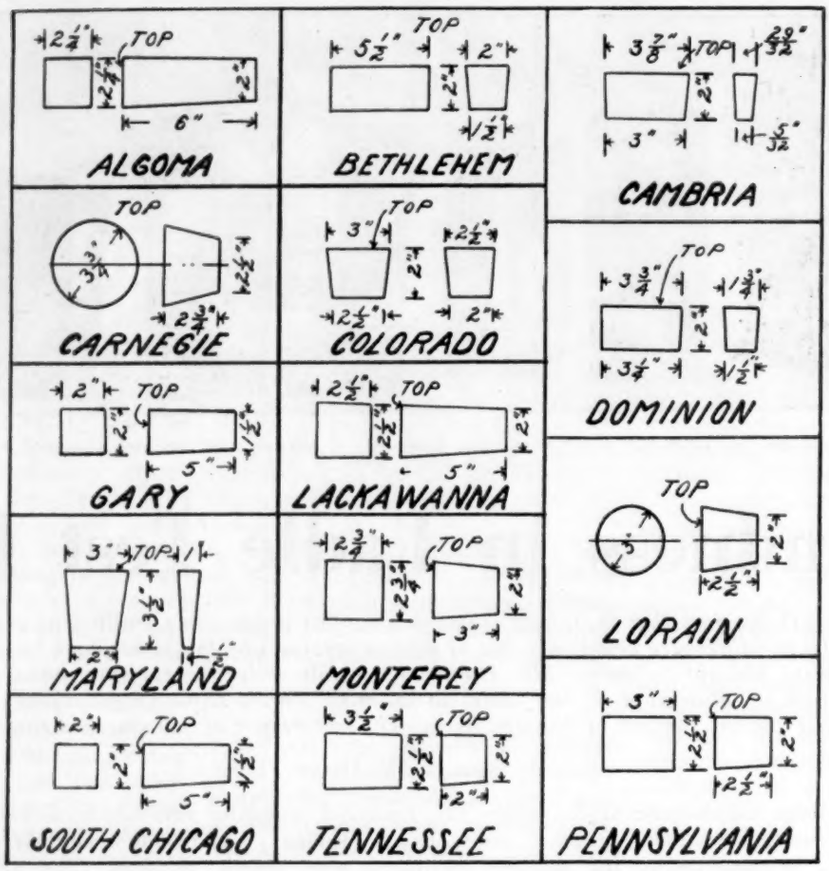

FIG. 2—DIAGRAMS OF VARIOUS LADLE TEST INGOTS

Obviously, the metal near the outside of the ingots differed from that near the inside and the location of the drillings with respect to the height particularly, also gave different results. The degree of porosity is apparently somewhat greater in the ingot from the first part of the heat than that from the last part of the heat, and further, the addition of the deoxidizing agent, ferro-silicon, experimentally in one case, made that ingot absolutely sound for most of its height. Nearly every rail mill has had a style of ladle test ingot of its own and the shape and dimensions of those in vogue about two years ago are shown in Fig. 2. Some of these have been changed since that time and Fig. 3 shows a collection of various ingots representing rail steel that have been lately cast and split open in order to show their interior condition. The ingots have been split in the center, and the half section showing unsoundness and piping is shown, together with the outside half elevation. It will be observed that many are extremely unsound and in such cases no doubt segregated. Those that are sound, except for the pipe, have had aluminum added, with the result that a quiet setting steel free from blow holes has been obtained. Soundness, or freedom from blow

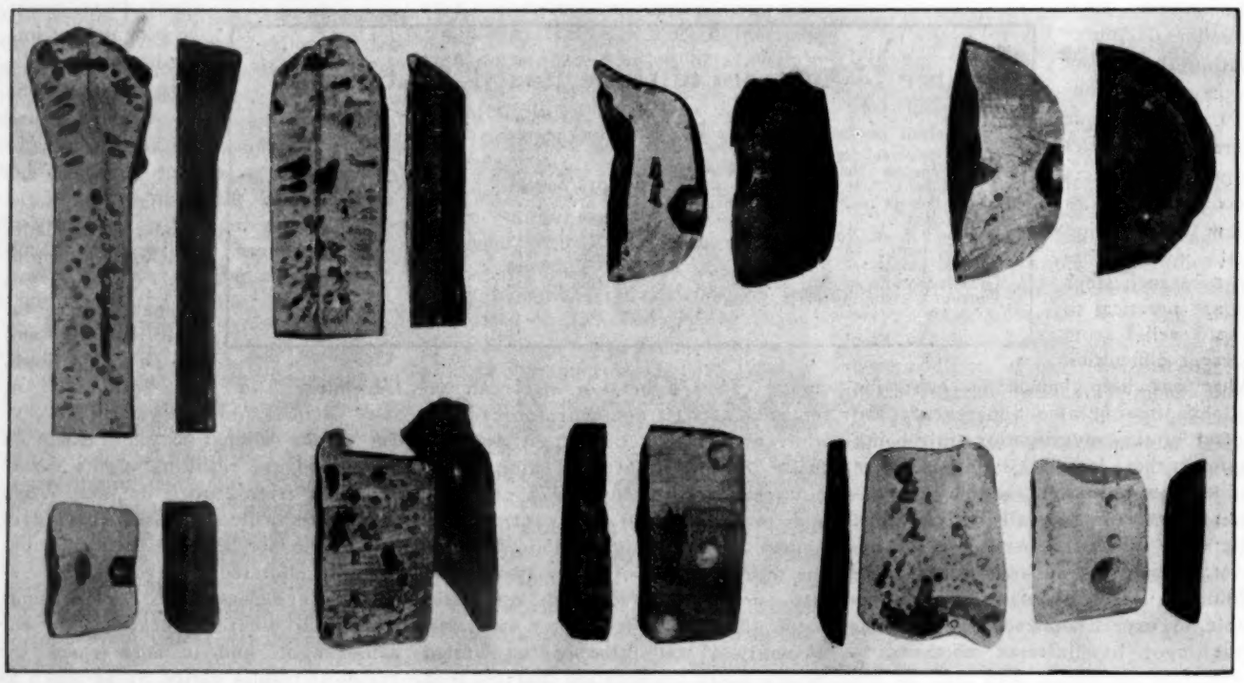

FIG. 3—SAMPLES OF LADLE TEST INGOTS

holes, etc., is a very important feature for ladle test ingots to possess. In the first place, the more unsound the ingot is, the more it is inclined to be segregated, and secondly, in drilling steel that is full of blow holes, minute particles break off from the sides of the holes and render the chemical determination for carbon by combustion methods more difficult to determine accurately than when thin flake-like drillings are furnished.

Shape No Index of Soundness

From the results shown in Fig. 3, it is quite evident that the soundness of the test ingot is not predicated by its shape. At the same time it is logical to regard a thin slab-like shape as preferable, because of its tendency to chill quickly and thus solidify with a minimum degree of segregation. The disadvantage of this shape of test ingot is principally in the difficulty of obtaining sufficient drillings to provide for the requisite number of analyses. The addition of a deoxidizing agent to insure a sound setting steel and a ladle test ingot free from blow holes is more or less common practice at some mills, and commercially pure aluminum in the form of pellets is admirably adapted for this purpose. Fig. 4 shows two ladle test ingots, about one-third size, cast in similar molds of as nearly identical steel as it is possible to obtain from the stream filling a single large mold.

In sample *A* no aluminum was used, with the result that the ingot was spongy, boiled badly in the mold and showed considerable segregation on analyses of different samples from the exterior and the interior. In sample *B*, the addition of a little aluminum made the metal set absolutely sound, except for the inevitable pipe, while analyses of drillings from corresponding locations, as in the first case, indicated that the segregation had been materially reduced without appreciable influence on the amount of carbon present. Both ingots were drilled at the locations shown, from the outside in and also on the inside. Thus there were six sets of drillings in each case. Results for carbon, by combustion, are shown in Table II.

It would thus appear that aluminum acted toward retarding segregation by causing the metal to set solid, without appreciably raising the carbon

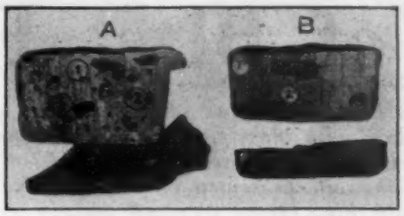

FIG. 4—TWO LADLE TEST INGOTS OF SAME STEEL, *A* AS POURED AND *B* WITH ALUMINUM

by its action in opposing segregation. The efficacy of aluminum additions is further shown by reference to Fig. 5, which illustrates three ladle test ingots, to which aluminum was added at the time of pouring. The types of ladle test ingots shown are slow in cooling, because of their shapes and dimensions; and much reason exists for anticipating spongy and segregated metal. Yet in every instance the steel, from the three widely separated mills represented, and which ordinarily make what may be termed a low silicon or raising steel, has been made to set sound and clean by using aluminum. Careful analyses of these ingots on samples taken at various locations fails to detect any segregation beyond the limits of chemical error.

Below are given results for carbon, by combustion, on drillings taken as shown; No. 3 in each case being from the outside in as the ingot would ordinarily be drilled, and Nos. 1 and 2 being on the inside in order to show segregation, if any is present:

	No. 1.	No. 2.	No. 3.
Ingot A	0.634	0.61	0.607
Ingot B	0.706	0.728	0.71
Ingot C	0.572	0.563	0.574

From the three analyses made on each ingot it is clear that little, if any, segregation exists in either case.

Table II---Tests for Carbon in Ladle Ingot

Ingot.	Location No. 1.	No. 2.	No. 3.	Average.
Without aluminum—outside	0.692	0.663	0.708	0.683
Without aluminum—inside	0.640	0.686	0.72	0.682
With aluminum—outside	0.667	0.715	0.695	0.692
With aluminum—inside	0.70	0.686	0.70	0.695

	With aluminum.	Without aluminum.
Greatest difference outside samples	0.048	0.045
Greatest difference inside samples	0.014	0.08
Greatest difference all samples	0.048	0.08

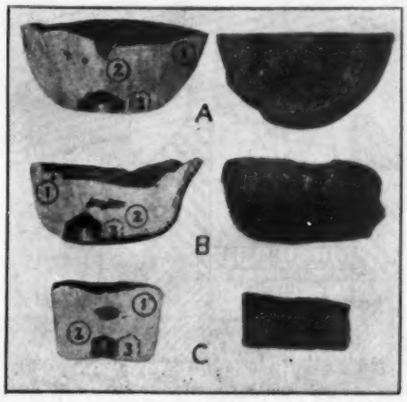

FIG. 5—LADLE TEST INGOTS TO WHICH ALUMINUM HAD BEEN ADDED

Test Ingot Specifiations

Based on the experience of the past, therefore, the author feels constrained to recommend such additions to rail specifications as will provide:

First, a standard shape and size for ladle test ingots with directions as to the size of drill and location of the borings on which the analysis is made. Second, the additions of aluminum, preferably in the dipper, when necessary to insure a sound setting steel in the ladle test ingot with freedom from blow holes.

In conclusion, it appears that the location of the test ingot in the heat with respect to the regular ingots cast, is also deserving of consideration, as is also the precise method of making the analysis for the various chemical elements; but as these matters must of necessity require much time and study, it would seem that they can be best left to development by the Testing Materials Society. The above mentioned recommendations are perhaps more pertinent to present conditions, and warrant early consideration.

The Minnesota School of Mines has issued an exceedingly valuable publication entitled "Bibliography of Minnesota Mining and Geology". This book puts into a convenient form for quick reference all of the great amount of material descriptive of Minnesota mining operations. The book contains 157 pages and is cross-indexed in a manner which permits the location of any articles describing various phases of Minnesota mining activities.

The Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has recently issued leaflets discussing the application of automatic control apparatus to cranes and steel mills. The scheme of the main connections is shown and the method of operating the magnetic unit switches, as arranged for the severe service of steel mill practice is described.

Utilization of Blast Furnace Gas

LITTLE ATTEMPT has been made thus far to regulate scientifically the operation of boilers run in connection with blast furnace plants. The need of such regulation is pointed out by Mr. Diehl, who describes the results of tests with various types of boilers and burners. The data presented in this, the third of a series of four articles, will be of value in establishing future standard practice in furnace plant boiler work.

By A. N. Diehl

THE boilers in operation at the present time in most blast furnace plants are small units, varying, in general, from 250 to 500 horsepower. They are usually equipped with feed-water heaters, but rarely with superheaters or economizers. The settings are often leaky and the baffles in bad condition, and in nearly all plants these most important details have been lost sight of until their presence and effect have been demonstrated by observations of flue-gas analyses and temperatures. It would be safe to state that the efficiency of the average blast furnace boiler plant could be increased from 5 to 10 per cent by the repair and constant upkeep of settings and baffles.

The burner in general use, which will be referred to as the common burner, is a burner only in the sense in which the term might be applied to the open end of any gas pipe.

Presented at the Cleveland meeting of the American Iron and Steel Institute, Oct. 22. Third of four installments. The author A. M. Diehl, is assistant general superintendent, Duquesne Works, Carnegie Steel Co.

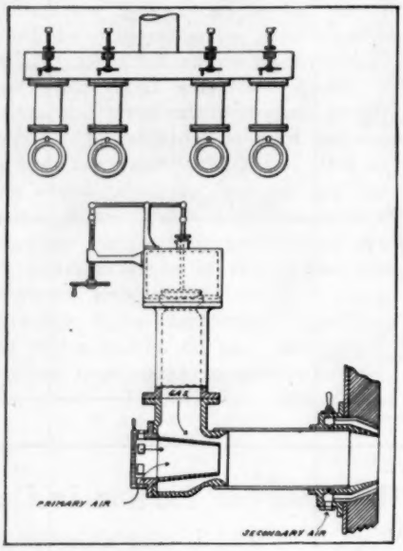

FIG. 9—ONE FORM OF BIRKHOLZ BURNER

The gas enters in a solid rectangle or circle, and the air in a thin layer around it, no pretense being made of completely mixing the two gases before ignition. This work is left to the combustion or mixing chamber, which, unfortunately, shares the work with half or all of the boiler.

In the operation of this boiler equipment, there has been little attempt at scientific regulation. The only method of controlling gas pressure and quantity is the butterfly valve placed in the supply line to one or two boilers. The function of boilers in a blast furnace plant is to burn, as efficiently as possible, the gas that remains after the constant quantity demanded by the stoves and gas engines have been supplied. The pressure in the system, where clean gas is used, through a central cleaning plant, is controlled from there, upon whose signals the boiler operators vary the positions of the butterfly valves and therefore the quantity of gas burned in the boilers. This method of control is used in order to insure the required pressure at all times at the gas cleaning plant, and it is proper that the boiler plant should take the variations. This being the case, pressure regulation at the boilers is not to be considered, and the problem is to supply an amount of air

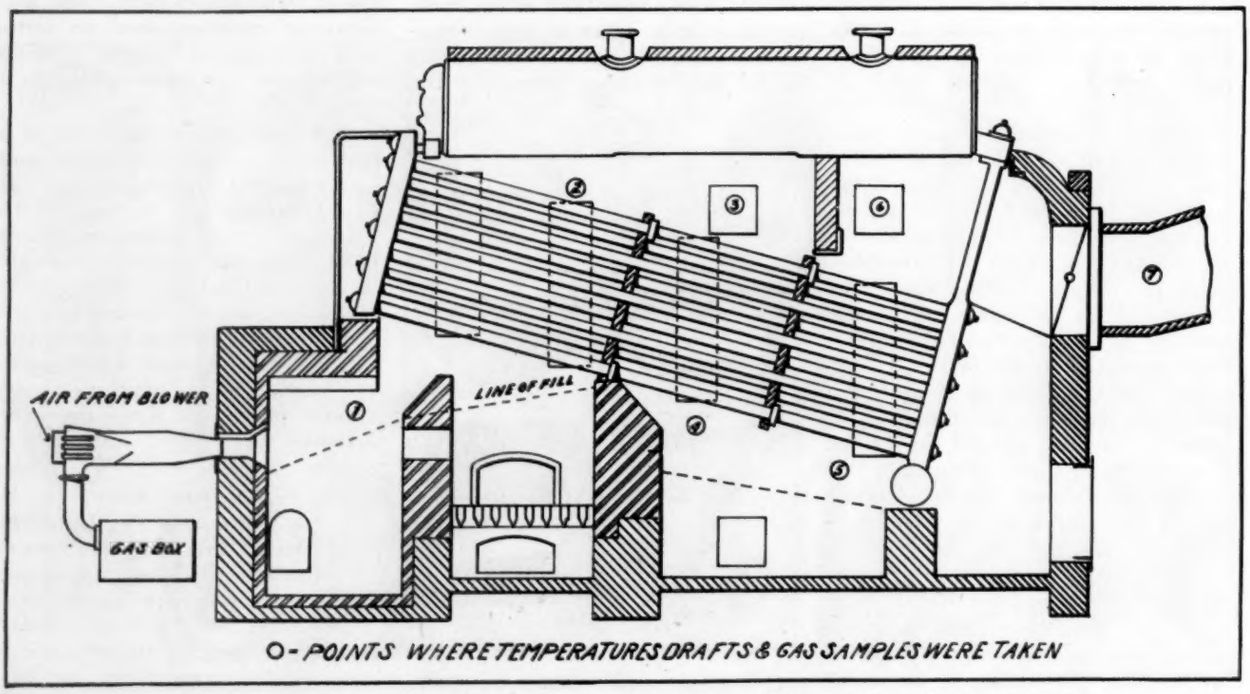

FIG. 8—BOILER USED IN TESTS ON VARIOUS TYPES OF BLAST FURNACE GAS BURNERS

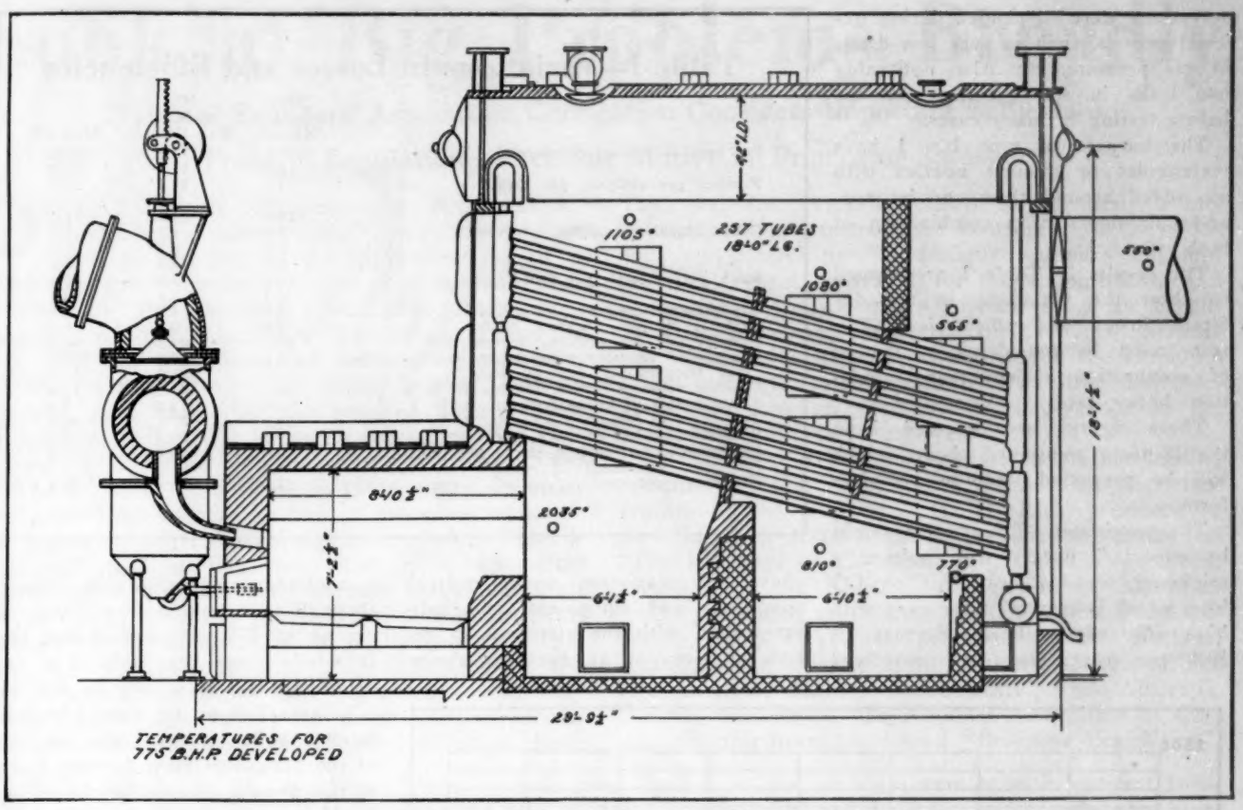

FIG. 10—BABCOCK & WILCOX 500-HORSEPOWER BOILER AT McKEESPORT PLANT, NATIONAL TUBE CO.

always proportional to the quantity of gas available. With most equipments, this can be attempted by means of a damper regulation, in combination with sufficient air openings around the burners. The adjustment of dampers, under present operating methods, is given very little attention, and, without intelligent supervision, would be of small value.

Probably the best results with the common burner would be obtained by automatic damper regulation, controlled by pressure in the gas box between the butterfly valve and the burner. By this means more nearly correct amounts of air and gas would be supplied, thereby decreasing, to some extent, the losses due to large air excess when gas pressure is low and large quantities of carbon monoxide in the flue gas when the pressure is high. With present equipment, a good mixture of air and gas and the resulting high flame temperature are obtained only by constant and careful attention. However, regular testing is extremely profitable, due to the increased efficiency obtained by repairs to settings and baffles, by regulation of the air supply in so far as this is possible, and because of its tendency to both educate and interest the working force in securing efficiency. When rough gas is used the regular blowing off of the boiler tubes assumes considerable importance. Observations of stack temperature, with all other conditions constant, before and after blowing tubes show decreases of from 50 to 100 degrees Fahr., Fig. 12, with an average of about 75 degrees Fahr., varying, of course, with the amount of dust in the gas and the volumes of gas burned. There is a loss due to excessive air leakage through open doors while the tubes are being blown, and with this fact considered, it appears that the most economical period of blowing is every 12 hours, as it is after this length of time that the deposit accumulates rapidly, causing a correspondingly rapid rise in stack temperature. Where rough gas is used, the installation of permanent dust blowers may be found advisable.

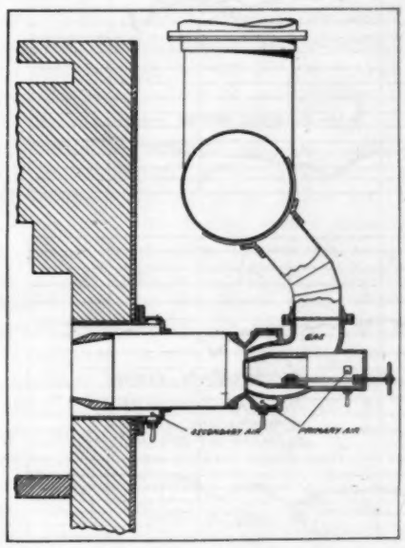

FIG. 11—ANOTHER TYPE OF BIRKHOLZ BURNER

The average efficiency of a blast furnace boiler plant, using common burners and operating without the aid of technical supervision, is not over 50 per cent and frequently is much lower. The losses of 50 per cent are distributed about as follows: Sensible heat in waste gases, 36 per cent; CO loss in waste gases, 9 per cent; radiation, 5 per cent. This distribution varies greatly with load, gas pressure and position of the stack damper. The average result of 28 eight-hour tests, conducted at the Duquesne blast furnaces on several 250 horsepower, Babcock & Wilcox boilers, Fig, 8, is as follows:

	Per cent.
Stack loss	35.7
CO loss	8.4
Radiation	5.0
Efficiency	50.9
B. H. P.	300.0 = 120 per cent [builders rating]

While these tests were conducted under operating conditions, the results may be considered slightly better than a continuous average, as ob-

servations were suspended during unusual periods, such as very low drops in gas pressure, etc. Also noticeably bad leaks in settings were patched before testing in many cases.

The burners of type No. 1 have rectangular or circular nozzles with air added around them, or by separate air doors or a combination of both.

The results in Table I are quoted to show the variations in the different losses and efficiencies. The tests must be considered as studies of combustion rather than regulation boiler tets:

These figures are selected from the 28 tests mentioned above, which will be presented later in complete form.

The maximum efficiency, as might be expected, occurs with neither a minimum sensible heat loss or CO loss, which is generally the case with high efficiences. This efficiency of 59.4 per cent may be considered about the maximum under present conditions and equipment, and indicates that, with the attention to details of operation as discussed above, a continuous operating efficiency of about 58 per cent is possible at rating up to 175 per cent of full load. It would seem that this is a very low figure yet it is safe to say that it is exceeded in but very few blast-furnace boiler plants. The efficiency of the Duquesne blast furnace boilers at the present time is in the vicinity of 55 per cent, the plant furnishing steam in addition to all blast furnace requirements, electric power and water pumping, at the rate of 2,000 boiler horsepower per furnace. Twenty-two plants of the United States Steel Corporation, having a total boiler horsepower of 241,504, show an average operating efficiency of 55 per cent.

Table I---Variations in Losses and Efficiencies

		Max. stack loss. Min. eff.	Min. stack loss. Max. CO loss.	Max. eff.
Per cent of ratings developed		110.0	112.0	125.0
Furnace gas analysis, per cent	CO_2	13.4	13.0	13.2
	CO	24.8	25.5	25.5
	H_2	3.6	3.5	3.6
Comb. chamber analysis, per cent	CO_2	16.9	19.6	21.2
	O_2	7.5	0.2	1.4
	CO	1.0	8.1	6.1
Stack gas analysis, per cent	CO_2	8.1	16.1	18.2
	O_2	14.3	5.9	6.4
	CO	0.0	3.5	0.2
Gas pressure, inches		3.5	4.0	3.5
Draft in furnace, inches		0.30	0.35	0.42
Furnace gas temperature, degrees Fahr.		60.0	300.0	60.0
Combustion chamber temperature, degrees Fahr.		1,706.0	1,690.0	1,765.0
Stack temperature, degrees, Fahr.		628.0	565.0	785.0
Calorific value of furnace gas cu. ft. B. T. U.		90.3	92.3	91.0
Sensible heat of furnace gas cu. ft. B. T. U.		0.0	4.8	0.0
Total heat of furnace gas cu. ft. B. T. U.		90.3	97.1	91.0
Sensible heat lost in stack, per cent.		59.1	22.2	34.1
Unconsumed CO lost in stack, per cent.		0.0	23.8	1.5
Radiation (assumed)		5.0	5.0	5.0
Efficiency, per cent.		35.9	49.0	59.4

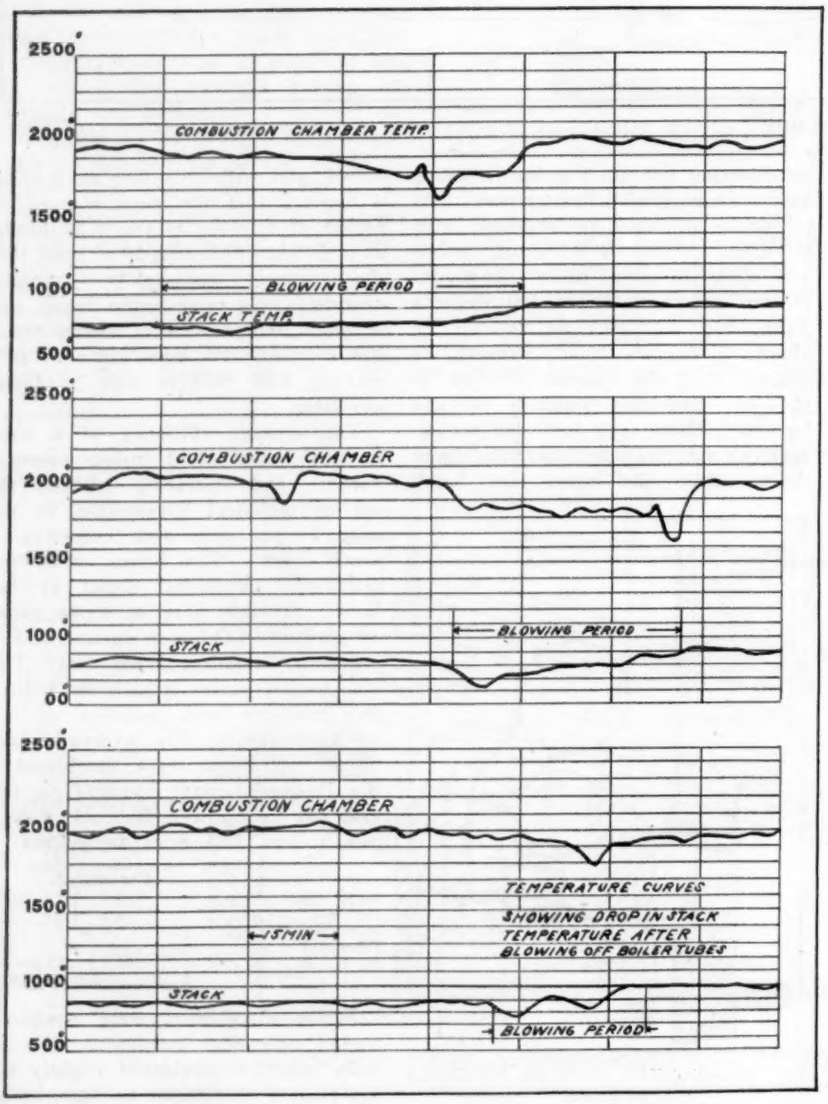

FIG. 12—DROP IN STACK TEMPERATURE AFTER BLOWING OFF BOILER TUBES

An example of the high efficiencies that are possible with the old-style burner, coupled with large boilers, long combustion chambers, excellent condition of settings and baffles, sufficient air supply, damper regulation, and close attention is presented in the performance of the 500 horsepower Babcock & Wilcox boilers, Fig. 10, at the National Tube Co., McKeesport, Pa. The results and calculation at McKeesport were checked by the experimental engineering department of the Duquesne works, and are:

Per cent of rating developed		155
Furnace gas analysis, per cent	CO_2	13.0
	CO	25.6
	H_2	3.2
Combus. cham. analysis, per cent	CO_2	24.7
	O_2	0.1
	CO	2.0
Stack gas analysis, per cent.	CO_2	21.2
	O_2	3.7
	CO	0.6
Furnace gas temp., deg., Fahr.		300
Combus. chamber temp., deg. Fahr.		2,040
Stack temp., deg. Fahr.		545
Calorific value of furnace gas per cu. ft., B. T. U.		91.9
Sensible heat of furnace gas per cu. ft., B. T. U.		4.8
Total heat of furnace gas per cu. ft., B. T. U.		96.7
Sensible heat lost in stack, per cent.		19.0
Unconsumed CO lost in stack.		3.7
Radiation (assumed)		5.0
Efficiency		72.3

(*Continued on page* 1060b.)

Look at Big Problems Broadly

National Founders' Association Convention Considers Important Subjects—

Trend of Legislation—Excellent Motive in Promoting Safety

OF FAR greater significance to American industrial and commercial life generally than a mere meeting of the representatives of a single important industry, was the annual convention of the National Founders' Association, held at the Hotel Astor, New York, Nov. 17 and 18. Not only was the convention featured by addresses by the presidents of four other leading national business associations, but the remarks of a number of speakers indicated a keener appreciation than ever before of the need for closer cooperation of the various branches of business in this country, in order that united action may be had in grappling with the problems that confront business as a whole. Prevailing sentiment, in fact, was that while an active association is a prime need of each individual craft or industry, in order to deal with the problems peculiar to that industry, it is vitally necessary that there be developed at once a co-ordination of the efforts which heretofore have been made separately by the various associations for relief from conditions and tendencies menacing the members of all of them. The association recorded itself as opposed to any unwarranted and uneconomic shortening of the work day; condemned the La Follette seamen's bill and urged its repeal; provided for the appointment of a committee to study foundry appliances for the benefit of all its members; considered the matter of arranging a plan of insurance protection for the employes of its members, and listened to interesting addresses and discussions on problems of importance to the nation and individual employer.

Half-hour talks by presidents of four other leading national business associations, formed an important feature of the program. H. H. Rice, president of the National Metal Trades Association, spoke on "The Equation of Co-operation"; Col. George Pope, president of the National Association of Manufacturers, submitted an address on "Industrial Preparedness"; John P. Wood, president of the National Association of Woolen Manufacturers, spoke on "The Limitations of Business Associations", while Albert G. Duncan, president of the National Association of Cotton Manufacturers, discussed "Business Legislation".

THE address of H. H. Rice, president of the National Metal Trades Association, was devoted to a general resume of the developments in the campaign for an 8-hour day. So much has been heard of the 8-hour day of late, said Mr. Rice, that a great many people already are accepting it as having arrived, while the majority consider that if it has not already arrived, the date is not far distant. Mr. Rice denied emphatically that the 8-hour day is here, and he declared further that the vital considerations involved in such a reduction of the working schedule make it impossible that the 8-hour day ever, under the present economic scheme, can become general.

Discusses Strike Problems

Mr. Rice also interestingly discussed conditions at various manufacturing centers which recently have been the scenes of machinists' strikes. The results show that where the manufacturers resisted the demands of the men, the latter shortly came back to work at the old terms. The granting of the 8-hour day by large concerns in Bridgeport, Ct., he said, was due entirely to a lack of courage on the part of these employers since at the time the first demands for the 8-hour day were granted in that city, less than 200 machinists actually were on strike. Mr. Rice expressed the belief that if the manufacturers of Bridgeport had maintained a united and firm front in the 8-hour day controversy, the present situation in that city never would have developed. Where manufacturers, owing to the prosperity they are enjoying because of the war demand, are able to grant their employes war bonuses or temporarily to advance their wages, the men should be given to understand that such increases are entirely the result of the present unprecedented and special conditions.

An address on "Industrial Preparedness" was submitted by Col. George Pope, president of the National Association of Manufacturers. American industry requires preparedness, said Mr. Pope, exactly as our army and navy requires preparedness. Col. Pope called attention to a recent conference participated in by President Wilson, the secretary of the department of commerce and the chairman of the federal trade commission, in which it was decided that the secretary of commerce would recommend to congress the enactment of a law making the selling in this market by foreign concerns, at prices less than the cost of production in this country "unfair competition" punishable under the anti-trust law. He also called attention to the likelihood that the federal trade commission in its report to congress would recommend an amendment to the Clayton law permitting combinations, in the form of co-operative selling agencies, for the development of an export trade. In regard to labor troubles, Col. Pope said many disputes arise over wages and hours because of a wholly misconceived idea of the exact causes. An employer might be willing to grant an advance in wages were he an independent factor and were his particular industry unrelated to general industry. Disorders concerning wages and hours of labor, said Col. Pope, are due, fundamentally, neither to employer nor employe, as such. The causes are deep and complex and should be studied with a view to interpreting them properly.

Activity is Abnormal

George F. Monaghan, general counsel of the association, delivered an address touching on the important legislative and labor problems with which business men in this country now are confronted. The activity obtaining in this country in munition manufacturing plants and plants adjunct thereto is highly abnormal, said Mr. Monaghan. Some people consider that after the war this country will experience great prosperity as the result of the continued future upbuilding of the export trade. Others, however, believe that the cessation of the war will be attended by a measure of calamity such as that experienced on the outbreak of the war. As a measure of preparation, said Mr. Monaghan, it is highly essential, in either case, that careful consideration be given certain important questions, chief of which is the tariff. In order to regain their lost prestige in the markets of the world, the European countries, on the conclusion of hostilities, will push their production of all kinds of manufactured articles to the fullest extent possible and it is to be expected that the lowest possible prices will be

offered to attract foreign buyers. Such a situation, he said, greatly will imperil our manufacturers if the termination of the war finds this country still unfortified by a protective tariff. Mr. Monaghan emphasized the necessity of recalling all adverse legislation, if American manufacturers are to take advantage of their present opportunities and to protect themselves against the future. Among the measures which he said must be recalled, is the act creating a federal trade commission, which represents the fruition of an effort by the government to visualize complete supervision over the industries of the country. While no objection can be offered to many provisions of this act, it grants such complete powers of investigation that, if not construed by the commission in the interest of industry and commerce, it might work great harm.

Mr. Monaghan also discussed the 8-hour day. While the demand for an 8-hour rule has not yet become universal, he said, there is an unrest in labor circles throughout the country begotten of the conditions attendant on the big war demand and there is a growing tendency toward its adoption, due to the fact that a number of the important plants have granted the reduction in hours. The opinion of most manufacturers, said Mr. Monaghan, is that workmen cannot do as much work in eight hours as in nine or ten. This might have been true under conditions which obtained a number of years ago, but the use of machinery since has become so general that in very few occupations is a man exhausted by working ten hours. Mr. Monaghan emphatically stated that the general adoption of the 8-hour day undoubtedly would mean the disruption of industry in this country and he classed as unpatriotic the action of certain employers recently in granting the demands, since they are hurting industry in general and themselves as well. As a case in point, he mentioned the establishment of an 8-hour day by the Ford Motor Co., which, according to current opinion in Detroit, already has had a serious effect on the operations of other manufacturers in that city. Manufacturers who are enjoying such prosperity that they feel able to grant to their men an 8-hour day without reduction of wages should consider the economic effect which would follow the general adoption of this schedule. The result would be a reduced ability on the part of the people to purchase commodities.

An interesting address by W. S. Kies, vice president of the National City Bank, New York City, was on the subject: "Our Foreign Trade and Its Possibilities." One of the fundamental handicaps on American manufacturers in their efforts to build up an export trade is our form of government. Not only are we extremists in our methods of dealing with problems, but with every election the policy of the administration is likely to change, so that no manufacturer six months ahead of election time feels sure of the future. There is too much "thou must" and too little "thou mayest" in our laws today, said Mr. Kies. In this connection, he mentioned the Clayton act and the federal trade commission act. On the other hand, said Mr. Kies, there has been some beneficial legislation recently, including the exceedingly important revision in our banking laws, which permits the establishment of branch banks abroad. As a result of this provision, the National City Bank on Nov. 10, 1914, established its first bank at Buenos Ayres. Incidentally, this bank now ranks fourth among 19 banks in Buenos Ayres in the volume of clearings. The National City Bank also has representatives in Russia, Scandinavia and Chile and will establish a man shortly in Spain.

The National City Bank, declared Mr. Kies, is doing all it can to extend American export trade and to this end is glad to furnish information on foreign conditions, on the market for any particular product and to give other needful particulars to manufacturers who are interested in the countries in which the bank has representatives. Another important provision recently adopted, said Mr. Kies, permits national banks to accept bills of exchange arising out of foreign trade. The credits thus lodged in New York, he stated, naturally will exert a great pulling power on foreign trade. It is highly essential that this country develop immediately a merchant marine and, if necessary, congress should grant a subsidy or provide some other plan whereby the difference in the cost of operating American and foreign ships may be made up to our ship owners.

Mr. Kies referred to the great wave of gold, now flowing into this country due to war orders, as a menace, insofar as it is breeding extravagance. One trouble with this country is that thrift does not exist here. He recommended that investors put their money in foreign investments, as it is largely by investing abroad that we will develop a foreign trade. In this connection to encourage investment in foreign securities, a stronger attitude is needed on the part of our government in protecting our foreign investments. Mr Kies does not believe this country will be flooded with foreign goods on the conclusion of the war, but he does believe that in one or two years following the war, our manufacturers here will suffer greatly unless properly protected against the low prices which English and German manufacturers will quote in their effort to regain their foreign commerce. Among legislative needs for the development of an export trade, he said, is a law which shall permit the combination of companies which are seeking to develop such a trade.

Mangus W. Alexander, of the General Electric Co., West Lynn, Mass., as chairman of the committee on safety and sanitation, submitted an interesting report. The work of the committee during the year has been along two lines: Investigation of the hazards of the foundry industry and methods by which they can be minimized; and the publication of bulletins designed to enlighten members of the association on the results of this work. Mr. Alexander showed samples of various safety devices which have been improved during the year. One of these was a new type of goggle which reposes comfortably on the face of the workman, admitting, at the same time, ample ventilation; this may be supplied with lenses of any desired color. He also showed a new type of helmet for use in arc welding. This was of fibre board, weighed less than two pounds, and was provided with a combination of green, red and white lenses, this combination having been found to be scientifically correct for protecting the eyes of the arc welder. Another improved device was the well-known molder's safety shoe which has been provided with a toe reinforced on the inside to protect the toes of the wearer. A new device was designed to guard lathe operators from flying chips. Mr. Alexander showed the new 1916 model, N. A. S. O. first aid jar, in which the contents have been rearranged. Louis Wiard, of the Wiard Plow Co.,

Founders Oppose Shortened Work-Day

Whereas, the demand for a shorter work-day, which would result in diminished opportunity for increased earnings by thrifty workmen, has been recently intensified by unwarranted agitation, and

Whereas, compliance with such a demand would result in a decreased output to the manufacturer and a consequential increased cost of general commodities to the consuming public,

Therefore, be it resolved, that The National Founders' Association, in accordance with a vote of its members, is unalterably opposed to legislative or other enforced uneconomic reduction in production hours.

Batavia, N. Y., and a member of the state industrial commission of New York state, spoke on Wednesday morning under the title of "A New Era in Industrial Relations in the State of New York". Mr. Wiard told of the problems that had been faced by the commission in the administration of its duties and gave a very hopeful statement of the results that had been accomplished and of the better feeling between employer and employe that had been brought about.

"As a manufacturer, I have preached the doctrine that we could not hope to successfully combat harmful legislation unless we ourselves came into court with clean hands, and that we must be examples of real progress along safe and sane lines and not mossback conservatives," he said. "I have striven to promote harmonious relations between capital and labor, believing that each has rights that the other is bound to respect. As a citizen, I maintain that there is a great third party to all industrial disputes whose rights are as important, if not really paramount to those of employer or employee, and that is the public at large."

Mr. Wiard drew some conclusions from his experiences as commissioner. He said one mistake of the manufacturers was to refuse to treat with their men when there still was a chance of amicable adjustment of strike. In the matter of accidents to workmen, 50 per cent at present are being settled direct in New York state. It would be much better if this percentage were around 90 per cent, the speaker said, and if fewer claims were settled through the insurance companies. Mr. Wiard said the striking thing encountered by the commission was the number of preventable accidents. Seven out of every ten accidents, it was found, could have been avoided. The speaker stated the insurance fund of the state is on a stronger basis than any insurance company in the country and that it is being administered at a cost to the manufacturers much below the premiums charged by private companies. Mr. Wiard urged the manufacturers to take greater part in the framing of laws affecting their business and their relations toward their employes and not to wait until acts are on the statute books before making protests and criticisms, as so often is the case at present.

Legislative Tendencies

James A. Emery, general counsel of the National Council for Industrial Defense, spoke on present tendencies in national legislation under the subject: "Shall Congress Regulate Production?" Mr. Emery described and illustrated by reference to specific acts, the trend of legislation in congress to regulate production under the constitutional authority giving control of interstate commerce to the national government. The speaker stated that the courts clearly have declared that production is not commerce and that the one is distinct from the other. A national child labor law, he said, represented an instance of regulation of production unwarranted by constitutional authority, notwithstanding the desirable and high-minded purpose of such legislation.

J. H. Schwacke, of Wm. Sellers & Co., Philadelphia, presented the resolutions. The association went on record as opposing any unwarranted shortening of the work-day, condemned the La Follette seaman's bill and urged that it be repealed or amended to promote the restoration of the American flag to its rightful place in international commerce. A resolution was adopted paying tribute to, and recognizing the long and earnest work of Marshall Cushing, who died during the year. The association sent a message of good-will to Henry M. Leland, president of the Cadillac Motor Car Co., Detroit, who recently suffered a fracture of his hip.

Good Work

Lyman P. Hubbell, chairman of the Filmore Foundry & Iron Works, Inc., Buffalo, presented the report of the finance committee. Especial attention was called to the excellent work rendered during the year by the committee on safety and sanitation. This committee disposed of more than $28,000 in safety appliances and reduced its net cost of operation to only approximately $300 or greatly under the appropriation originally made for it. A vote of thanks was given to the committee for its services and it was ordered to continue.

Theodore O. Vilter, of the Vilter Mfg. Co., Milwaukee, gave figures to show how the loss of time in his shop had been reduced several hundred per cent by adopting the methods suggested by the committee. Mr. Schwacke, whose company was among the first to adopt foundry leggings, stated that not a single instance of men being burned in the foundry had been met with since this protection had been used.

An important matter brought to the attention of the convention was the proposal that a committee on molding machines and allied appliances be named to make a complete study for the benefit of the general membership. It was left in the hands of the administrative council to appoint this committee and carry out this plan.

M. W. Alexander, of the General Electric Co., spoke of the drawing power exerted on employes by the insurance privileges afforded by trade unions. He thought it was up to the employers to hold out similar advantages and to work out a plan under which, by weekly payment, independent workmen may be assured equal or better protection than offered by the union. He thought this insurance should be extended to all molders who are employes of the National Founders' Association and that it should be withdrawn when a man leaves the service of any member of the association.

P. W. Gates, of the Hanna Engineering Co., Chicago, told of the experiences of the National Metal Trades Association in providing insurance for the employes of its shops. He said that organization found it difficult to induce the men to take out insurance under this plan, even at a small rate. The suggestion that the founders' association offer insurance to the workmen was left to the administrative council with power to act.

Matthew Griswold, of the General Electric Co., Erie, Pa., presented the report of the nomination committee. The officers chosen unanimously are as follows:

President—William H. Barr, Lumen Bearing Co., Buffalo.

Vice President—H. J. Boggis, Taylor & Boggis Foundry Co., Cleveland.

Commissioner—A. E. McClintock, Chicago.

Secretary—J. M. Taylor, Chicago.

Treasurer—Chicago Savings Bank & Trust Company, Chicago.

District Committees

First—D. K. Bartlett, Builders' Iron Foundry, Providence, R. I., chairman; W. B. Leach, Hunt-Spiller Mfg. Corporation, Boston, Mass., vice chairman; John A. Mead, Howe Scale Co., Rutland, Vt.; F. C. Fromm, Manufacturers' Foundry Co., Waterbury, Ct.; W. A. Stevenson, Norwood Engineering Co., Florence, Mass.

Second—James Eastwood, Benjamin Eastwood Co., Paterson, N. J., chairman; Edward Norris, Utica Heater Co., Utica, N. Y., vice chairman; H. P. Macdonald, Snead & Co. Iron Works, Jersey City; D. W. Sowers, Sowers Mfg. Co., Buffalo; James H. Caldwell, Ludlow Valve Co., Troy, N. Y.

Third—Stuart R. Carr, Stuart R. Carr & Co., Baltimore, chairman; C. W. Davenport, National Foundry Co., Erie, Pa., vice chairman; Wm. S. Hollowell, Harrison Safety Boiler Works, Philadelphia; Carl Koch, Fort Pitt Steel Casting Co., McKeesport, Pa.; J. Turner Moore, Reading Steel Casting Co., Reading, Pa.

Fourth—W. C. Slater, Bass Foundry & Machine Co., Fort Wayne, Ind., chairman; Jos. J. Wilson, Cadillac Motor

Car Co., Detroit, vice chairman; Geo. O. Rockwood, Rockwood Mfg. Co., Indianapolis; Charles F. Seelbach, Forest City Foundry & Mfg. Co., Cleveland; Samuel Blackburn, John B. Morris Foundry Co., Cincinnati.

Fifth — J. H. Steedman, Curtis Mfg. Co., St. Louis, chairman; James F. Lardner, Rock Island Plow Co., Rock Island, Ill., vice chairman; E. E. Baker, Kewanee Boiler Co., Kewanee, Ill.; W. H. Winslow, Winslow Brothers Co., Chicago; H. T. Hornsby, United Iron Works Co., Springfield, Mo.

Sixth—C. M. Power, St. Paul Foundry Co., St. Paul, chairman; W. W. Coleman, The Bucyrus Co., Milwaukee, vice chairman; C. A. Luster, Clyde Iron Works, Duluth; Chas. T. Jeffery, Thos. B. Jeffery & Co., Kenosha, Wis.; Max Babb, Allis-Chalmers Mfg. Co., Milwaukee.

Seventh—W. M. Gartshore, McClary Mfg. Co., London, Ont., chairman; Jno. M. Taylor, Taylor-Forbes Co., Ltd., Guelph, Ont., vice chairman; W. F. Angus, Canadian Steel Foundries, Ltd., Montreal, Que.; A. R. Goldie, The Goldie McCulloch Co., Ltd., Galt, Ont.; Geo. W. Watts, Canada Foundry Co., Ltd., Toronto, Ont.

Eighth—W. D. Trabue, Phillips & Buttorff Mfg. Co., Nashville, Tenn., chairman; Z. W. Wheland, The Wheland Co., Chattanooga, Tenn., vice chairman; E. Y. Hartwell, Hartwell Iron Works, Houston, Texas; W. D. Tynes, Hardie-Tynes Mfg. Co., Birmingham, Ala.; Geo. R. Lombard, Lombard Iron Works & Supply Co., Augusta, Ga.

Honorary Member—O. P. Briggs, Minneapolis.

Banquet Speeches

At the annual banquet held Wednesday evening, George F. Monaghan acted as toastmaster, the speakers being Charles Nagel, formerly secretary of the department of commerce, and Henry D. Estabrook, of New York. Mr. Nagel submitted an able address entitled "A Demand for a National Industrial Program". The prime need of this country at present, he said, is co-operation between government and business, of which there has been so little that he failed to see where businessmen get the courage to invest their money. The national government, he said, has assumed the right to control and punish any business engaged in interstate trade, but entirely has neglected to assume responsibility for the protection of concerns engaged in interstate trade. As a consequence of this negligence by the national government, the various corporations are left to the mercies of the legislatures of the states in which they do business. As in an instance of the failure of the government properly to consider the interests of industry, he mentioned the reciprocity bill passed during his term in the office of secretary of commerce. Instead of being consulted in the preparation of this bill, said Mr. Nagel, the first he knew of it was after it had been drafted finally. Businessmen, he said, lack courage in fighting politicians and he advised that they follow the example of the labor unions in making a united stand for what they need, in which case they will succeed in getting it. A national organization to represent business, such as is found in Germany, is highly necessary for safeguarding business interests here. Mr. Nagel made some strong statements on the need for a merchant marine, saying that while, prior to going to Washington, he had been opposed to the granting of a subsidy, he since has believed in the policy of paying money to benefit any industry which in turn will benefit the people. It frequently is contended, Mr. Nagel said, that it is unnecessary to build ships when the ships of other countries serve us. This theory is entirely wrong, he said, since, as demonstrated by recent events, foreign ships serve us only when they can be spared from the needs of their own countries. The only way we can build up a prominent and growing foreign trade, Mr. Nagel said, is by sending goods on ships carrying the stars and stripes.

Mr. Estabrook's address was devoted to the subject of self-defense. Mr. Estabrook refused the recent statements of Wm. Jennings Bryan, saying that after returning from a trip to the middle west, he can state that the men in that section of the country are entirely willing to defend against any possible enemies from without the country, which in 1861 they defended from the enemies within. To say that we are too big or too proud to fight, is absurd.

In order to secure our defenses, Mr. Estabrook said, it is necessary forthwith to spend money, and lots of it, since it is better not to arm at all than to be only half armed. He recommended the immediate upbuilding of a navy to rank second to none in the world and the laying in of a supply of ammunition sufficient to last at least for a year's campaign. He also recommended the constant maintenance of a skeleton army "which is capable at any time of taking on flesh". As an auxiliary to the navy, he said, it is necessary to create a merchant marine and to this end, he called for governmental action which should enable American ships to compete with the ships of the world.

Corner Stone Laid

Of McKinley Birthplace Memorial at Niles, O.

The corner stone of the McKinley birthplace memorial, at Niles, O., was laid Saturday, Nov. 20, with impressive ceremonies.

The life and achievements of Ohio's martyr President were lauded in addresses by Governor F. B. Willis, Myron T. Herrick, former ambassador to France; Congressman L. C. Dyer, of St. Louis, commander of the Spanish War Veterans, and James H. Hoyt, of Cleveland, who was an intimate friend of the distinguished Ohioan. The United States Marine band, under the direction of Major Charles B. Hanford, played "Lead Kindly Light", McKinley's favorite hymn, and the Strauss waltz, "On the Beautiful Blue. Danube," which was a favorite with Mrs. McKinley.

The guests of the day included Senators Atlee Pomerene and Warren G. Harding, of Ohio; Representative William A. Ashbrook, of Johnstown, O.; Harvey D. Goulder, Col. J. J. Sullivan, and others, of Cleveland.

Joseph G. Butler Jr., president of the association, in his address, said in part:

"Patriotism, protection and prosperity were the combined watchwords and slogan of William McKinley. He was a patriot from boyhood up and a protectionist from principle and conviction and a harbinger of prosperity until the end.

"It is early yet to estimate the value of William McKinley's life and its effect upon American history. Even now, great statesmen and world historians have agreed that the McKinley administration marked a most important epoch in American statesmanship, in its far-reaching influence upon the future of all nations. It was William McKinley who, though himself from the north, yet won the love of the south and knit the nation closer together. His administration brought prosperity. The factory chimneys aglow all over the country are in themselves inanimate monuments to the memory of McKinley."

James Verner Critchley, founder of the Critchley Machine Screw Co., Worcester, Mass., who sold out in July to Ralph B. Phillips, president of the R. B. Phillips Mfg. Co., Boston, of which company he is a director, has purchased a valuable piece of business property at Main and Walnut streets in that city, assessed for $300,000, on which he plans to build a 10-story office building.

Business News of Nation's Capital

Letters from Manufacturers Describe Difficulties of Extending Foreign Trade —High Cost of Battleships Shown by Latest Bids

Washington, Nov. 23.—Ready response is being made by business men throughout the country to the questionaire recently sent out by the federal trade commission. The purpose of the commission is to learn the views of manufacturers and merchants with regard to foreign trade conditions. Announcement was made today by the commission that nearly 10,000 replies have been received this early. They denote that the prevailing sentiment is favorable to export combinations, that concern is felt that this country will be a dumping ground for European goods after the war unless legislation is enacted to prevent this form of industrial invasion, and that an American merchant marine is an absolute necessity.

A machinery manufacturer of a large European business says: "On each trip, I have realized more strongly the difficulties and the deficiencies of the American manufacturer in his export arrangements, and also I have realized the necessity for training and knowledge and experience and cooperation to get a successful foreign business."

A producer of wire and wire goods writes: "Our observations and investigations of the export situation have shown us that co-operative organizations are almost a necessity."

Another manufacturer says: "We have tried many times to do business in South America as well as the orient. For a small concern this is an utter impossibility. We have had an exasperating experience with port duties, consul fees, fines for improper wording of bills of lading, improper boxing, improper net and gross weights and cubic contents, and dimensions. We are satisfied that these things as well as the financing of export operations can only be taken care of by large organizations equipped for the purpose."

Those opposing export combinations express the fear that they would prove oppressive, while others explain that the special nature of their own products or other reasons lead them to doubt the efficacy of combinations in their lines. A New England shoe manufacturer says:

"We have had 15 years' experience in foreign trade to all parts of the world, and we are decidedly of the opinion that where the article that is to be sold is in common use in the countries in which it is being offered, and it is of sufficient volume in quantity and amount, it is decidedly better to be represented by an individual salesman whose business it is to push that article for the house employing him."

A prominent coal and iron company writes: "We have recently, at considerable expense, put up plants here in connection with our by-product coke ovens for the manufacture of benzol, toluol and solvent naphthas. There is no doubt in our minds that we can continue these plants in operation after the war, provided we are only called upon to meet legitimate competition; but the well known German dumping policy, if carried to its ultimate conclusion, will undoubtedly force us to shut down these plants as soon as the Germans are in position to resume shipments to this country unless some amendment is made to our tariff law to prevent this unfair competition."

Many writers emphasize the handicap resulting from the lack of an American merchant marine. A northwest milling company says: "We are particularly interested in securing protection for the American manufacturer or shipper against restraint of foreign trade resulting from difficulties and handicaps imposed by foreign owned steamship lines. We realize more every day that the American manufacturer or shipper is entirely at the mercy and in the hands of foreign owned steamship lines.

"Foreign owned steamship lines are receiving in return for hauling wheat and wheat products from American seaports to European seaports at least 50, if not 75 per cent, of the total value of American wheat and products that are being exported to Europe. We are in position to substantiate our statements with specific and dependable data in our possession."

No Longer Available

Washington, Nov. 3.—In a ruling rendered last Friday, Acting Controller C. M. Forre, of the treasury department, held that the appropriation of $4,000,000 made June 7, 1900, for the construction of a government armor plate plant is no longer available. Secretary of the Navy Josephus Daniels had inquired as to the availability of the fund, which Mr. Forre claims has been covered into the treasury. He maintained that the provision related only to the expenditure of the appropriation made for armor and armament of vessels then under construction or construction authorized.

Who Will Build Them

Washington, Nov. 23.—Increased cost of materials and labor were reflected in the bids opened last Wednesday at the navy department for two battleships. Of the three private ship yards bidding, it is not believed that any of them gave figures which will come within the congressional limit of $7,800,000 for each vessel, exclusive of armor and armament, when certain costs are taken into consideration. On the other hand, the three navy yards putting in bids, those at Brooklyn, Philadelphia and Mare Island, Cal. were all within the limit, a thing not unexpected in view of the government's methods of figuring overhead charges. It was the first time that more than one navy yard, that at the Brooklyn yard being the only one capable of constructing such a craft, ever bid on a modern battleship. In the event that either or both of the two other bidding yards were awarded contracts, it would be necessary to enlarge the ways. This would call for appropriations by congress. If congress should not see fit to make the appropriations, which are desired by Secretary of the Navy Josephus Daniels, he would be compelled to give at least one vessel to a private yard, and inasmuch as no private yard appears to be within the limit, the department would face a real dilemma. Reopening of bids, it is held, would probably not result in lower tenders being offered. With this condition prevailing, the limit of $7,800,000 would necessarily have to be increased.

The Carnegie Steel Co. was the lower bidder on armor plate. It put in figures of $425 per ton on Class A-1; $486 per ton on A-2 (turret), and $460 on Class B, but did not bid on Class C (steel), the Midvale Steel & Ordnance Co. being the lowest on this grade at $376 per ton for one vessel. The Carnegie bids were

for either one or both ships. Its prices on classes A-1 and B were lower than the prices at which the navy department made awards for the battleships CALIFORNIA, IDAHO and MISSISSIPPI on Oct. 27, 1914.

Mr. Daniels has said that none of the private yard bids could be legally accepted, as all of them exceed the limit set by congress. He realizes, however, that he faces a long delay in having them constructed at the navy yards, two of which would have to be equipped for the purpose. The other, the Brooklyn yard, already has the CALIFORNIA under contract. The situation is worrying Mr. Daniels considerably.

The actual cost of accepting the private yard bids has been placed at the following figures:

New York Ship Building Co., $8,075,000; Fore River Ship Building, $8,097,000; Newport News Ship Building & Dry Dock Co., $8,240,000.

Mr. Daniels, as in the past, has indicated that he thinks the bids are too high, just as he always says armor plate bids are too high. He also has complained that the congested conditions of steel mills promise to cause delay in building the ships because of long deliveries of material. The reports that the department would declare an embargo against the exportation of structural steel, and, if necessary, enforce the common defense clause to compel fulfilment of orders in time for the United States have not been taken seriously. It has been accepted as being amazing that the department would assume that the steel companies would, at all events, first fulfill contracts with foreign powers. The ship building concerns gave no such impression, but merely pointed out delivery of steel would be delayed owing to the crowded condition of the mills.

The Dyestuffs Situation

Washington, Nov. 23.—The prevailing shortage of dyestuffs is making itself felt more and more acutely each day. The bureau of foreign and domestic commerce is constantly receiving letters from textile and other factories stating that operations must be totally or partially suspended in consequence of the inability to secure the coal tar dyestuffs hitherto in current use.

Although permission has been granted by the British government for the free passage of two steamer loads of coal tar dyestuffs of German origin to the United States, the embargo by the German government prohibiting the shipment of these dyes except in return for a supply of American cotton of equal value has not yet been raised. As a result, no dyestuffs of German origin have been received in this country since March 15, 1915.

Nearly all of the retort coke ovens in the United States are now supplied with the necessary equipment for rescuing benzol and toluol, which serve as raw materials for the manufacture of coal tar dyestuffs. Unfortunately, the demand of manufacturers of high explosives for these two hydro-carbons is so urgent that their prices still remain at very high figures. About a dozen plants are now engaged in the production of coal tar intermediates which serve for the manufacture of finished dyestuffs. Their output is being constantly increased. The seven different firms regularly engaged in the manufacture of coal tar dyestuffs are increasing each day their output of completed coloring materials.

Looking Toward Peace

Washington, Nov. 23.—During their visit last Saturday at the offices of the chamber of commerce of the United States, members of the French commission explained that their work contemplated fundamental changes affecting most of the important industries in France, manufacturing as well as agriculture. Many of the centers of the textile industry will have to be rebuilt. It is their purpose, with the co-operation of the American manufacturers, to reconstruct its industries and redevelop its agriculture along the most modern lines—above all, to install machinery of the latest type to take the place not only of the men and horses which will be lacking at the end of the war, but of the old methods and to enable France to produce her specialties in a more economic fashion. In return for the purchase of machinery in this country, it is said, the French hope for and expect an American market, perhaps a preferential market, for French goods made through the help of these machines.

The chamber of deputies is now sending men all over France to make an investigation into conditions; to find out just how many machines will be required when peace comes, how many men worked in each plant, and what improvements in building and equipment can be best installed. The commission will make an itinerary over this country and Secretary Elliot H. Goodwin, of the national chamber of commerce, will put the members of the commission into touch with officers of the chamber and the affiliated commercial bodies in the cities visited.

Rates on Ferro

Washington, Nov. 23.—The Pennsylvania, Baltimore & Ohio and other railroads which have filed tariffs with the interstate commerce commission withdrawing import rates on ferro-manganese and substituting domestic rates, which are higher, have submitted a reply brief before that body. It deals only with two points discussed in the brief filed by steel interests which have protested against the proposed new rates, claiming that the other points have been answered heretofore. The two questions taken up relate to what the railroads call the misapprehension by the protestants of the carriers' position with regard to the Underwood-Simmons tariff and to the reference to the fact that the import rates on manganese ore have not been withdrawn.

The railroad brief agrees with the steel interests that the interstate commerce commission is not empowered to adjust its decisions with reference to the tariff. Asserting that import rates create a preference in favor of those enjoying them, the brief points out that such a preference is increased by every reduction of the tariff. The present act transferred ferro-manganese to the free list. Taking up the manganese ore rate situation, the railroads argue that there is a total lack of proof that this rate operates to the disadvantage of the shippers.

New Chicago Machinery House

The Federal Machinery Sales Co., a $50,000 Illinois corporation, will soon open its store at 12 North Jefferson street, Chicago, the building formerly occupied by the Niles-Bement-Pond Co., and Pratt & Whitney Co.

The newly-elected officers of the company are: James L. L. Gough, president; J. B. Doan, vice president; Charles T. Bush, treasurer, and James Jay Sheridan, secretary. Mr. Gough has had many years' connection with prominent machine tool houses, latterly with the Strong, Carlisle & Hammond Co., of Cleveland; Mr. Doan is vice president and general manager of the American Tool Works Co., of Cincinnati; Mr. Bush occupies a similar office with Chas. A. Strelinger Co., Detroit, while Mr. Sheridan is a prominent attorney of Chicago.

It is understood the company will handle a full line of new and used machine tools.

News of Employers and Employes

How Temperance is Promoted at South Works, Illinois Steel Co.—
Progress in Settling Strikes at Various Points

DISAGREEING with the old idea of reforming by forbidding, believing that no law can regulate, William Alexander Field, general manager of South Works of the Illinois Steel Co., at South Chicago, has obtained results far beyond the ordinary by proceeding along the opposite course.

Few men have had the confidence in humanity to take as high a ground as has Mr. Field. Probably analysis of his method would reveal that its cornerstone is a belief that any human being, even the cheapest laborer in the plant, is the center of his own little world and that his desires and aspirations are as dear to him as are Mr. Field's own.

Great reforms have resulted at South Works, but they have been made by the men themselves as rapidly as they were able to see that their own interests were served best by better conditions. When men come to the point where they see that their efficiency and, as a result, their earning capacity and progress, are lowered by the use of alcoholic stimulants, they are likely to abandon their use.

If enough of the men in a given unit of society see this at the same time, it becomes the popular thing, just as the reverse is true in case of a unit where drinking is regarded as a matter of bravado.

Remarkable Changes

Some years ago at South Works, says "Tom" McKenney, who looks after much of the detail of safety work, the size of a workman's bar bill at the end of the month was a measure of his social standing among his mates. If he drank little, he was regarded as a weakling and suffered contempt at the hands of his fellows. From this condition of things to the voluntary and unanimous action by the committee of 40 workmen arranging the annual picnic of the works the past summer to have it a "dry" event is a long stride in progress and has covered a number of years.

But it is worth while.

Abstinence from liquor of all sorts has become so strong a sentiment at South Works that the occasional gatherings of heads of departments at banquets to honor one of their number who is leaving or for other reasons now are "dry" and the cost of liquid refreshments formerly deemed indispensible is diverted to other uses for betterment.

"The rule against liquor being brought into the plant is an old one," said Mr. Field recently to a representative of *The Iron Trade Review*, "and is the only rule about liquor ever made here. The safety movement was started at South Works a number of years ago, long before it had the breadth and importance it now possesses. It gained much impetus here before it was heard of to any extent outside. One of the first, if not the first, safety department, regularly organized, was at South Works, and that was 20 years ago.

"Such physical appliances as could be used to make machinery safer, guards and the like, were supplied, signs were placed and everything of a material nature was developed to the limit to prevent injuries. This policy has been followed consistently as new ideas have arisen.

"But the human element still entered in strongly and, in spite of safeguards, accidents continued to happen. There seemed to be a need for safeguards on a higher plane than mere material contrivances of steel and wood and iron.

"To gain safeguards on the mental plane, education to demonstrate the effects of indulgence was begun. This was by signs and suggestion only, but it has had an increasing effect.

"I believe no law can regulate effectually. I believe men must be educated in principles and then work out their salvation as seems best to them.

"As the situation now stands, the men, from the lowest to the highest, know that to remain in their positions and progress they must keep as fit as possible, as fit as the man working alongside them. They know that when advancement comes it will be to the man with the best power, the man whose faculties are brightest and least blurred by any outside influence, the most powerful of which is drink.

"Through the passing years the men at South Works have educated themselves to an understanding. You know Solomon said: 'Get wisdom, but with all thy getting get understanding.'

"I hope some day to have a referendum vote by the men of the works on the question whether the plant shall be 'wet' or 'dry'. I am satisfied that when that day comes, the men will vote it 'dry'. Then every man will be under the eye of his fellow workers and if he drinks, he will be tried by a safety committee and punishment administered, even to expulsion. This will be reform entirely in the hands of the men. They are most interested and on them the penalties of indulgence fall. As they come to a full understanding of the value of abstinence for their own good, they apply the remedies themselves. It is not necessary to forbid and seek to repress.

"In our safety work, we have had the mill committee inquire into cases of carelessness and inflict punishment. It has been done more drastically in many cases than the heads of departments could have done and has been taken in better grace by the culprits since it was decreed by men in their own walk, their peers."

Mr. Field feels deeply on these matters. He has been with South Works for many years in many capacities, working up to the highest position. He is in close touch with the men and knows most of them and more about them than most of the men suspect.

Some Conclusive Figures

To assist them in attaining their desires in the best way is a burden on his conscience and he has worked along what has seemed to him the natural line to obtain this end. He believes their children, who will man the works in years to come, will be better equipped to rise as a result of the improved moral and mental plane their fathers are occupying.

Some concrete results of the safety work and the voluntary suppression of liquor drinking may be cited to prove the actual results of a campaign along the higher lines.

Banquets of works officials no longer have liquors on the menu. This also is voluntary and no rule forbids their presence.

Since 1906, nearly 80 per cent of accidents have been eliminated.

On Eighty-eighth street, which leads to one of the entrances of the works, four out of seven saloons have closed and along the Strand, once a notorious saloon and disorderly row, two blocks

long facing the works, scarcely a bar remains.

Workers are saving money and in the recent hard period when work was scarce, there was little destitution. Of that observed and relieved, 85 per cent was due to the use of liquor by the wage earner.

Observation of those who leave the works at noon is being undertaken and kindly efforts to restrain them will follow. The number who pass the gate at noon is lessening and men who do not drink are objecting to having drinkers in positions where their acts may cause danger.

Demands Granted

Trenton, N. J., Nov. 23.—The machinists' strike in this section has been ended in some plants, as a majority of the larger firms have granted the demands for an eight-hour day. The J. L. Mott, Mercer Auto, John A. Roebling's Sons and National Flue Cleaning companies have signed the agreement in this city and the Standard Fuse Co., of Bordentown, agreed to the demands of the men. Three of these firms are engaged in making war munitions. More than 7,000 machinists in New Jersey have already been given the shorter hours. The Victor Talking Machine Co., Camden, N. J., granted the demands to 2,000 machinists. The De Laval Steam Turbine Co. is trying to get out of town machinists to take the place of the strikers.

New Pension Plan

The Stanley Rule & Level Co., New Britain, Conn., has adopted a plan of pension for its employes which goes into effect shortly after Jan. 1, 1916. According to the plan, all men reaching the age of 70 and having been in continuous employ of the company for 25 years or longer, shall be retired and pensioned. All women who have reached the age of 60 years and have been in the service of the company continually for 25 years or longer shall be retired and pensioned on the same terms. Any man who has reached the age of 65 years with continuous employment by the company for 25 years or more shall be retired and pensioned at his request. Any woman who has reached the age of 55 years and has been in continuous service for 25 years shall be retired and pensioned on the same terms. All men reaching the age of 60 years with 25 years of continuous service may be retired and pensioned at request of either employe or the company, but at the discretion of the company. All women reaching the age of 50 years with a record of 25 years' continuous service may be retired on like terms. Any employe who has been 20 years or longer in continuous service and become permanently totally incapacitated through no fault of his or her own, as a result of sickness or injuries received while on duty, may be pensioned at the discretion of the company. Any employe who has been in the service of the company for 30 years consecutively may, at his own request, be retired and pensioned at the discretion of the company.

The monthly pension is based as follows: One per cent of the average monthly pay during the last ten years of service multiplied by number of years of service, provided that no pension shall exceed $1,000 per year or be less than $250 per year.

Madison Machinists Strike

Madison, Wis., Nov. 23.—Upon the refusal of the Steinle Turret Machine Co., Madison, to meet their demands for an eight-hour day, time and a half for overtime, and double time for Sunday work, 150 machinists went on a strike and left the company with only 60 machinists at their posts. The strike is the result of long agitation by imported union labor workers in Madison and other points in Wisconsin, and is the first serious trouble encountered by a Wisconsin tool manufacturer since the beginning of the great rush of orders for machines for producing war munitions. The Steinle shops have been working 23 hours a day for several months and just before the strike order was issued, had received a rush order for 30 turret machines from the Bethlehem Steel Co. to replace the same number of Steinle tools destroyed with the shop at Bethlehem 10 days ago. George E. Steinle, president of the company, said: "We will not stop running because we have lost these men. I am a machinist myself and the Steinle company will continue to operate if I have to operate it alone." Mr. Steinle refused to entertain a delegation from the machinists' union and said he would talk to the strikers only as individuals. E. L. Adams, Washington, D. C., organizer for the grand lodge of machinists, is directing the strike. Pickets are on duty but up to this time there has been no trouble. The strikers have been paid in full and there has been no demonstration.

Heavy Pay Roll

Reports issued by Pittsburgh banks indicate that the daily pay roll in the Pittsburgh district now amounts to more than $1,000,000, or at the rate of approximately $30,000,000 a month. Representatives of foreign concerns are visiting Pittsburgh almost daily attempting to buy locomotives, steel rails, steel car springs, bridge material, steel wire, coke, etc. The head of the United States labor distribution branch at Pittsburgh, says the scarcity of labor is becoming more noticeable.

Conditions in New England

Donald Tulloch, secretary of the Worcester, Mass., branch of the National Metal Trades Association, in a statement of the machinists' strike conditions in that city, says that during the eight weeks of its existence the men have lost in wages $287,000. Not a single employer has granted any demands and picketing is on the wane, he says. He refers to the strike being a failure in Providence, Pawtucket, Woonsocket, Athol, Boston, Hartford, New Haven and other New England cities and says in Worcester the cause is practically lost.

Joseph H. Gilmour, who is in charge of the Worcester strike for the international association of machinists, says that of the 3,409 machinists who are out, about 2,000 have gone to work in other New England cities, principally in Connecticut. "Unless the strikes are soon settled", he says, "Worcester will be drained of machinists. We are going to continue to send men out of town until there are no strikers left and in the meantime we are planning to call attention of machinists in other shops who are not organized to the fact that they can secure higher wages and shorter hours outside of Worcester."

Jail sentences have been imposed on 13 strikers of the International Silver Co., Meriden, Ct., for participating in a riot, Nov. 14. Three others, arrested at the same time as rioters, were acquitted. The trouble occurred on a Sunday when the company rushed a force of strike breakers and guards through a picket line the strikers had posted about one of the factories. A pitched battle, in which revolvers and stones were used, followed, but no one was seriously injured. All the available police in Meriden were rushed to the scene, and after the arrests the disturbance died down. It is estimated that there are about 3,000 employes on strike in the city of Meriden.

H. A. Steen, of the employment department of the Union Metallic Cartridge Co., Bridgeport, Ct., is touring New England in search of skilled mechanics, without limitation as to the number. He secured nearly 150 in Worcester Thursday because of the strike there.

Iron and Money: Fact and Comment

Prominent Bankers Advise Clients to Invest—May Cut Interest Rates—Directorship Causes Wrangle

LEADING. Chicago bankers are openly urging depositors to reduce their deposits in banks by purchasing good investment securities and thereby relieving the banks of their surplus money. It is hinted that unless deposits are reduced, the interest rates on saving accounts may be lower. Coming at a time when the Chicago banks are financing the crop movement, this situation is indeed remarkable. The resale of American securities continues, but no fear is expressed that it will become a demoralizing factor. On the whole, the past week was a quiet one on the stock exchange.

Monday's market was rather erratic, with coppers about the only strong stocks.

Tuesday the war shares again became more prominent and there was considerable activity in other lines. Steel stocks remained in the background. Strength in foreign exchange was attributed to the new British credit in this country for London banks. The minimum will be $50,000,000, which may be expanded to $300,000,000, the funds to be devoted to grains, cotton and other staples.

Wednesday morning, a number of stocks advanced sharply, but a general decline occurred in the afternoon. There was some profit-taking. Lackawanna Steel rose over 5 points and Bethlehem was again a leader.

Rail stocks were strong Thursday, but there was a general reactionary tendency in the industrial list. General Motors, however, was an exception, making a net gain of 29 points. The first call of the Anglo-French financial commission for a 30 per cent payment on the $500,000,000 loan recently underwritten was issued. This first payment is to be deposited to the order of the commissioners in the National City Bank of New York on or before Nov. 29.

Speculation was light Friday and transactions amounted to only about 583,000 shares, the lightest for a full session in two months. Sterling exchange was strong, closing at 469½. The purchase of the New York State Steel Co. by William H. Donner aroused some discussion.

In the half-day session Saturday, reactionary tendencies were again strong. Quotations sagged and speculation was not particularly active.

Quotations at the close of business Nov. 20 and changes in the leading stocks identified with the iron and steel industry for the week are shown in the following table:

	Close Nov. 20.	Net Change.
American Can	59¾	—2⅝
American Can, prfd.	108⅜	+ ⅜
Amer. Car & Fdy. Co.	82	—1⅜
Amer. Car & Fdy. Co., prfd.	117½	.....
American Locomotive	69½	+2
American Locomotive, prfd.	103½	+4¼
American Steel Foundries	60⅜	—3⅜
Baldwin Locomotive	113	—9
Baldwin Locomotive, prfd.	110	+1
Bethlehem Steel	475	+35
Bethlehem Steel, prfd.	161½	—1
Colorado Fuel & Iron	51½	—2½
Continental Can	88¼	—3¾
Continental Can, prfd.	.....	...
Crucible Steel	73½	—3¾
Crucible Steel, prfd.	108	+ ⅜
General Electric	175	—2½
Internat'l Harv. of N. J.	108⅛	—1⅜
Internat'l Harv. Corp.	69	—1
Internat'l Harv. Corp., prfd.	.....	...
Lackawanna Steel	81	— ⅜
Nat'l Enamel'g & Stamp. Co.	28¼	—3½
Nat'l En. & Stmp. Co., prfd.	93¾	+1¼
Pressed Steel Car	66¾	— ¼
Pressed Steel Car, Prfd.	104¼	+ ⅜
Pullman Palace Car	166½	+ ⅜
Republic Iron & Steel	50⅞	—2⅛
Republic Iron & Steel, prfd.	108¾	+2¾
U. S. Cast Iron Pipe & Fdy.	26¾	—1¼
U. S. C. I. P. & Fdy., prfd.	54	— ½
United States Steel	86⅜	—1¼
United States Steel, prfd.	115⅞	— ⅝
Westinghouse Mfg.	67½	—2¼

The following table shows changes in maximum quotations of stocks not listed on the New York stock exchange:

	High Nov. 19.	High Nov. 12.
American Radiator	365	....
American Ship Building	36½	36
Cambria Steel	69¾	70⅛
Chicago Pneumatic Tool	85	83
Inland Steel	318	....
LaBelle Iron Works	55	59½
Lake Superior Corpn.	10⅜	10⅜
Pennsylvania Steel	....	70
Stewart-Warner Speed. Co.	91	83¼
Warwick Iron & Steel Co.	10¾	10½
Westinghouse Air Brake	140	141½
Westingh'se Elec. & Mfg. Co.	70¾	70¾

Contest for Director

A contest for representation on the board of directors of the Crucible Steel Co. of America developed at the annual meeting at Jersey City, Nov. 19. Harry C. Eldridge of New York City, appeared at the meeting with proxies and unsuccessfully attempted to have himself elected a director. The following directors whose terms had expired were re-elected: A. W. Black, J. W. Dougherty, R. H. Illingsworth, Geo. E. Shaw, G. W. Sargent and O. H. Wharton. It developed at the meeting that Horace S. Wilkinson of Syracuse had resigned as a director at a meeting held several days previously in Pittsburgh and had been succeeded by E. L. French of Syracuse. Mr. Wilkinson gained public attention last July by a published statement that the rapid rise of Crucible common stock was not warranted by the company's earning position. Herbert W. Depuy, chairman of the company, announced at the meeting that war orders aggregating about $17,000,000 had been booked. He reported a very active demand for tool steel which has advanced from 75 cents to $3 a pound, considerable of which had been due to the high cost of tungsten, arising from the shutting off of imports.

May be Sold as Junk

Indianapolis, Nov. 23. — Three junk dealers last week offered to buy a traction line, known as the Fort Wayne & Springfield Interurban Railway, which is being offered for sale by a receiver. The junk dealers offered $51,674.45 for the property, which is said to have cost $600,000. No one seems to have desired the interurban line and the junk dealers offered to buy it, so that the equipment might be dismantled. The dealers offering the bid were I. A. Kalver, Decatur, A. Bornstein, Indianapolis, and Abe Freinburg of Muncie. They may be permitted to take possession of the property, if no other bids are received.

Geiger-Jones Case

Judge John E. Sater, in the United States district court in Columbus, Nov. 19, refused to grant a temporary restraining order against Attorney General Edward C. Turner, while granting one against superintendent of banks, Harry T. Hall, restraining him from revoking the license of the Geiger-Jones Co., dealer in securities, Canton, O., which had asked that Turner be restrained from rendering his opinion concerning the methods of the company and that Hall be restrained from revoking its license. Judge Sater announced that the hearing on the merits of the case will be held in Cincinnati, Nov. 27, when the constitutionality of the so-called "blue sky law" of Ohio will be decided by Judges Howard Hollister, J. W. Warrington and J. E. Sater. Although not restrained from so doing, Mr. Turner decided to refrain from publishing his opinion until after the court decides on the merits of the case.

A receiver has been appointed for the Union Foundry & Machine Co.,

operating a foundry and machine shop on the South Side, Pittsburgh. The receivership is not expected to continue indefinitely.

Machinery Exports

Show Increase in September—Aeroplanes Not So Popular

Additional details now available in regard to foreign commerce for September show that the shipments of motor trucks which declined sharply in July and August increased by nearly a million and a half dollars in September. The popularity of aeroplanes seems to be waning, for the value of exports for September was only $101,950, compared with $588,600 in August and $880,836 in July. The value of metal working machinery exported declined somewhat, as did also that of agricultural implements. The total value of machinery exported for September was $12,277,389, compared with $11,439,391 in August and $5,295,667 in September, 1914. The total value of iron and steel and the manufactures of exported in September was $38,415,180 as compared with $37,726,822 in August, and $12,531,102 in September, 1914.

The value of exports of zinc, except ore and dross, show a slight increase over August, the figures being $3,257,835 in September, 1915, $3,010,922 for August, 1915, and $2,503,630 for September, 1914.

IRON ORE IMPORTS.

	September, 1915.	September, 1914.	Nine months end. September, 1915.	Nine months end. September, 1914.
Spain	.....	6,397	32,946	47,326
Sweden	6,925	21,582	154,619	262,519
Canada	32,068	4,478	48,235	33,625
Newfoundland & Labrador.	.....	11,000	.....	38,515
Cuba	109,110	65,671	610,698	631,214
Oth. countries.	25,150	48	124,600	81,773
Total	173,253	109,176	971,098	1,094,972

EXPORTS OF MACHINERY.

1915.	Motor trucks.	Agricultural implements.	Aeroplanes.	Metal working machinery.
Jan.	$2,545,527	$429,745	$71,315	$2,903,740
Feb.	3,022,482	762,606	6,000	2,523,722
Mch.	4,725,563	1,567,327	89,450	3,863,913
Apr.	5,240,481	1,534,715	318,492	3,300,953
May	6,583,912	1,711,379	83,950	3,762,567
June	8,578,802	854,670	283,212	3,735,562
July	6,803,001	963,534	880,836	3,872,358
Aug.	4,387,193	1,454,606	588,600	3,624,411
Sept.	5,882,255	1,092,797	101,950	3,256,973

Cleveland Cliffs Bond Issue

Stockholders of the Cleveland Cliffs Iron Co. have received notice that the company contemplates an authorized $3,500,000 collateral trust 6 per cent bond issue to reduce floating debt and to make permanent provision for future requirements.

The bonds will be dated Nov. 1, 1915, and will mature serially in semi-annual installments from Nov. 1, 1917, to May 1, 1927, inclusive. They will be redeemable prior to maturity on any interest date, to Nov. 1, 1920, at 101, and thereafter at 100½, and denominations will be $1,000, $500 and $100.

Of the total authorized $1,050,000 are to be issued at this time and offered to shareholders at par and interest; they will mature Nov. 1, 1917, to May 1, 1920, inclusive. Shareholders can subscribe until Dec. 1 this year. If more than the amount to be issued is subscribed for, allotments will be made pro rata to the holdings of all subscribing shareholders.

Enlarge Foundry

A rapidly increasing business has necessitated the enlargement of the Birdsboro Steel Foundry & Machine Co.'s plant at Birdsboro, Pa. The contract for the new building has been let to L. H. Focht & Son. The plans call for a building similar to the erecting shop constructed by the company several years ago, of cement construction on a brick sub-base. The building will be completed in February. Posts, girders, tie beams and roof construction will be of structural steel with a slag roof covering. The main building is to be 60 x 240 feet. A lean-to on either side will increase the molding floor space, side sash affording plenty of light. Ventilating sash will be a feature of the roof construction.

Sand-cast and chilled rolls and alloy rolls in all sizes will be manufactured at the new Birdsboro plant. Its equipment will include two cupolas and two air furnaces, one of 30-ton and the other of 10-ton capacity. Roll pits, drying ovens, annealing furnaces and 30-ton and 10-ton electric cranes will be included in the equipment of the shop. In order to make test cuts or to finish rolls completely, roll lathes will be installed at one end of the building. The plant will be served by a siding from the W. & N. railway, which will traverse the building. A traveling crane along the south side will handle raw materials for the cupolas and air furnaces. The capacity of the new foundry will be from 600 to 800 tons of rolls per month.

Plans for this addition are largely the work of the company's general manager, Leon E. Thomas, who has had wide experience in the design, manufacture and finishing of all types of rolls and rolling mill machinery. Mr. Thomas has occupied his present position for 10 years. The Birdsboro company in all probability will undertake the manufacture of machinery for the rolling mill trade on a larger scale than heretofore, new equipment in various departments having added greatly to its capacity. The company now employs about 700 men and the foundry addition will necessitate the employment of approximately 100 men.

Many More Men

Are Being Given Employment in Detroit Factories

The Detroit board of commerce has obtained figures showing that factories in the city are now running much stronger than a year ago and that prospects are far more encouraging. A year ago, there was a period of pronounced depression in the automobile business and a canvass of 34 manufacturing plants showed that approximately 82,000 men were out of employment. It was on the basis of this information that the commerce board organized an employment bureau. A canvass of these same plants, made a couple of weeks ago, now shows that there has been an increase of 80 per cent in the number of men employed in these plants over 1914 and most manufacturers are putting on workmen as fast as applications are made.

The Packard company has announced that it has more than 10,000 men at work in its shops and that laborers, skilled and unskilled, are being put on continuously. A year ago, the Packard company was running a force of 3,500. The Northway Motor & Mfg. Co., an accessory concern, reports that its force has been increased from 700 to more than 2,600 in less than a year while the Studebaker Corporation has added more than 1,500 workmen to its pay-roll and is now running with a force of more than 5,000 men. The Metal Products Co. has increased its working force from 500 to 1,200 and the Peninsular Stove Co. has put on more than 1,200 men, being shut down at this time last year. The Hudson Motor Co., has increased from 600 to 900 men while the Detroit Screw Works has added 800, now running a force of 1,100. The Continental Motor Co. is running strong with 2,100 workmen whereas a year ago it gave employment to but 1,300. The Chalmers Motor Co. is running with 3,500 men at the machines; a year ago it gave employment to 1,680. The American Car & Foundry Co. has 1,000 laborers in its plant against 350 in December, 1914. The Timken-Detroit Axle Co. is working a force of 2,600 against 900 12 months ago.

The Burroughs Adding Machine Co. is one of the big manufacturing institutions to announce a decrease in its working force. A year ago, it gave employment to 2,150 and now is running with a force of 2,070, but this force will

be maintained throughout the winter.

Members of different committees, in the Board of Commerce, declare that working conditions in Detroit will soon be the best the city has ever seen and that a shortage of workers in all departments may even be looked for.

The Ford plant, which is the city's largest motor car manufacturing concern is running heavy and is now, it is believed, giving employment to more than 14,000 persons. This, of course, includes the various branches and this force will be held throughout the winter months.

The New Willys-Overland Company

Toronto, Nov. 23.—A new Canadian company, to be known as the Willys-Overland, Ltd., capitalized at $6,000,000, will be formed to take over the Canadian business of the Willys-Overland Co., of Toledo, O., and the motor business of the Russell Motor Car Co., Ltd., of Toronto. The extensive works of the Russell company here will be taken over and additions made, providing for the complete manufacture of the Overland and Knight motor cars. John N. Willys, head of the Willys-Overland Co., of Toledo, will be president, and T. A. Russell, of the Russell company, vice president. It is understood that the Russell company will retain its corporate existence and continue as a manufacturer of bicycles and skates and war munitions. The shareholders of the Russell company will receive $1,000,000 preference stock in the new company, $200,000 common stock and an additional $100,000 paid in cash. The Dominion Steel Corporation's new merchant steel mill has been put on double shifts as the result of the heavy demand for shell steel. The company has had to refuse orders for some steel products calling for quick delivery on that account.

Forging Company Enlarging

The Endicott Forging & Mfg. Co., Inc., Endicott, N. Y., has just purchased additional real estate, consisting of about one acre, east of its present plant, and running parallel with the Erie railroad. The purchase of this additional property is to provide for future extensions. The company has added considerable new equipment, and has also engaged the services of Sackett & Parks, architects and structural engineers, of Syracuse, N. Y., to draw plans for new additions on the west end of the present plant.

The Endicott Forging & Mfg. Co., Inc., took over the plant of the L. S. White Co., in July, last, and has now about five months' business on its books. It has found it necessary to enlarge the plant, and to provide for future extensions in order to take care of its constantly increasing business.

Alliance Machine Co. Expanding

The Alliance Machine Co.'s business at Alliance, O., is increasing so rapidly that it is now making building and equipment improvements, which, when completed, will double its present capacity and make it the largest manufacturing plant in its lines of cranes, special machinery, etc., in the United States.

The orders which are making this company expand in such unprecedented manner are in its regular lines of work, viz., cranes of all kinds and mill machinery, and the company emphasizes the fact that it is not in any way engaged in making shrapnel shell or ammunitions of any kind, as has been several times reported.

This doubling of the manufacturing facilities following so closely upon starting its subsidiary concern, the Alliance Structural Co., not only shows that it is meeting the exacting demands of the large steel industries in this country and abroad, but it also means much for its home city, as the company will have a pay roll of from 1,000 to 1,200 men by next spring, most of whom will be skilled mechanics.

Has Big Contract.—The Campbell Electric Co., Lynn, Mass., has secured a contract for the manufacture for Russia of several million time fuses, and because of the necessity of considerable more space has leased an additional factory. Several hundred more men will be given employment as a result of the order. The contract was placed by a syndicate of which John H. Madden, of that city, is a member. The capitalization of the Campbell company is $300,000 and plans have been made to increase this to $500,000.

Wealthy Men of the Lake Superior Region

(Fifth of a Series of Short Talks on Iron Mining)

BY P. B. McDONALD, Mining Engineer

The iron ranges, particularly the Mesabi, have made many millionaires. A number of them reside in Duluth, the important and busy city strung along a hill at the extreme head of Lake Superior, which has managed to outdistance its adjoining rival, Superior, Wis. A man who is getting 25 cents per ton, as royalty, on all the iron ore hoisted from a mine is a man of some consequence, because every time the skip comes up and dumps, it is a matter of a dollar or so, and the skip dumps many times during the day and in the long hours of the night—in fact a skip at a Lake Superior iron mine is about as busy as an elevator in a women's department store on bargain day. It is worthy of note, too, that in many cases those made wealthy by the discovery of iron ore on their lands, have been the pioneers of the district, men who came and settled in the place when things didn't look very well.

The Lake Superior region is a country of big mines developed and operated in a solid way. The vigorous, beef-eating Cornishman was instrumental in opening the mines, and has impressed his personality on the mining communities; which tendency for substantial practicality has been further added to by the magnificent size of the ore deposits as proved up, in many instances turning out in excess of the wildest dreams of the discoverers.

For the most part, the Superior iron range towns are trim looking, prosperous communities with the advantages of the bracing Lake Superior climate. For a great mining region, the country is singularly flat and tending toward woods and swamps, especially in Minnesota; in Michigan, there are some fair-sized hills, but no mountains to speak of. Recently, commercial clubs and business men of the northern peninsula of Michigan have been booming the district to attract agricultural settlers and have given it the engaging name of "Cloverland."

Many Tools Bought in Small Lots

Foreign Buying Again Active—Crane Market Comes to Life—Western Railroads Seek Machines—Mill Builders Busy

MUCH activity continues to prevail in the machine tool market. While the week just closed was not featured by any spectacular transactions, the total business booked was large. Buyers are experiencing increasing difficulty in securing satisfactory deliveries. High prices are being paid for second-hand tools, especially lathes, and dealers are scouring the market for such equipment. Foreign buyers continue to inquire eagerly on lathes and other tools for the earliest possible shipment and some good business was entered during the week, particularly from Russia and France. These countries took several lots of second-hand lathes, which will be shipped immediately. Some good-sized orders also were placed by foreign buyers for shipment within two or three months. Domestic munition manufacturers made additional purchases of lathes and other equipment; among such buyers were the Nathan Mfg. Co., New York; the Simplex Mfg. Co., and the Wasson Piston Ring Co., New Brunswick, N. J., and the Crocker-Wheeler Co., Ampere, N. J.

Buying of machine tools by eastern railroads during the week was of good proportions, although none of the orders placed was large. The New York, New Haven & Hartford, Norfolk & Western and other roads, placed a few tools each. Numerous crane orders have been placed and the demand is keeping up, so that crane manufacturers are becoming more and more particular in regard to the terms and conditions they quote on new business. Among eastern concerns who are extending their plants are the Arcade Malleable Iron Co., Worcester, Mass.; the Newark Gear Cutting Machine Co., Newark, N. J.; the National Tool Co., Waterbury, Ct.; the Crucible Steel Co. of America, Harrison, N. J.; the American Cupro-Nickel Co., Stamford, Ct.; the Catchpole Boiler, Foundry & Machine Co., Geneva, N. Y.; C. Cowles & Co., New Haven, Ct.; the Norwich & New York Propeller Co., Norwich, Ct.; the Lake Torpedo Boat Co., Bridgeport, Ct.; the Morrow Mfg. Co., Elmira, N. Y.; the E. W. Bliss Co., Brooklyn, and the Curtis Aeroplane Co., Buffalo..

Chicago Market Brightens

The demand for machine tools in the Chicago market is increasing after a period of comparative quiet. Canadian buyers are entering the market more actively and several buyers were here during the past week endeavoring to obtain equipment for Canadian shops. Most of them desired lathes from 24 to 30 inches. It is apparent from the nature of other inquiries that considerable car business has been placed in Canada. All lines of machinery are feeling the effect of better business conditions throughout the country. Lines which have not been depleted by war demand are moving well but lathes for export are difficult to obtain. Deliveries from builders are improving, though some trouble has been experienced on shipments through Detroit on account of a freight handlers' strike. The Rock Island railroad has been inquiring recently for a few small tools and a large steelmaker is inquiring on a considerable number of machines to increase its shop facilities.

Railroads Enter Pittsburgh Market

Buying of locomotives by the Pennsylvania lines west presages a general activity on the part of the Pennsylvania and other railroads in the equipment market of the central west. Strikes and threatened labor troubles have delayed deliveries of machine tools. Shipments of lathes, grinders and milling machines cannot be promised in less than three or four weeks. Alex. Laughlin & Co., Pittsburgh, have placed a number of contracts for the Steel Co. of Canada, which is increasing its open hearth capacity. Orders include a 125-ton ladle crane and a 40-ton and 10-ton traveling crane, which will be furnished by the Shaw Electric Crane Co. Necessary stripping and charging equipment also has been ordered. Builders of heavy rolling mill equipment are operating plants at maximum capacity. The Seaman-Sleeth Co. is increasing the capacity of its foundry. The company is filling several large orders for export.

Cincinnati Builders Delayed

Cincinnati machine tool builders are falling behind on deliveries as a result of a strike of union machinists that has continued for more than a month. Apparently the strike is losing ground, as workmen are returning to their places daily, but none of the plants has been able to run at capacity. Practically all of the machine shops in the city have full order books and they are beginning to find it difficult to make shipments promptly. At Hamilton, O., the strike situation is still acute. The largest inquiry before the market is the request of the Bethlehem Steel Corporation that all Cincinnati machine tool makers state their quickest shipping time on lathes, drills and milling machines. The Webster & Perks Tool Co., Springfield, O., will add to its equipment shortly, following an increase in its capital stock from $25,000 to $150,000.

EASTERN STATES

SOUTHBRIDGE, MASS. — The Hamilton Mfg. Co., has started work on a 2-story, 60 x 75-foot addition.

BRIDGEPORT, CT. — The Lake Torpedo Boat Co. has started work on a 1-story, 80 x 100-foot forge shop.

NEW HAVEN, CT.—The C. Cowles & Co. have started work on a new brass foundry.

NORWICH, CT.—The Norwich & New York Propeller Co., Prentice's dock, has let a contract for a 3-story addition.

BROOKLYN, N. Y.—The E. W. Bliss Co. has let a contract for a 3-story, 20 x 320-foot ammunition plant addition.

BUFFALO, N. Y.—The J. P. Devine Co., 1322 Clinton street, has let a contract for a 2-story, 90 x 100-foot factory building.

BUFFALO, N. Y.—The Stirling Engine Co. will erect an addition.

BUFFALO, N. Y.—The Curtis Aeroplane Co. has begun work on a 1-story addition to cost $80,000.

BUFFALO, N. Y.—The Crosby Co., Pratt and William streets, has begun work on a 1-story, 30 x 125-foot foundry addition.

BUFFALO, N. Y.—The King Sewing Machine Co. has let a contract for a 1-story, 32 x 36-foot addition.

ELMIRA, N. Y.—The Morrow Mfg. Co. has let a contract for a 1-story, 167 x 450-foot heat treating building and also for a

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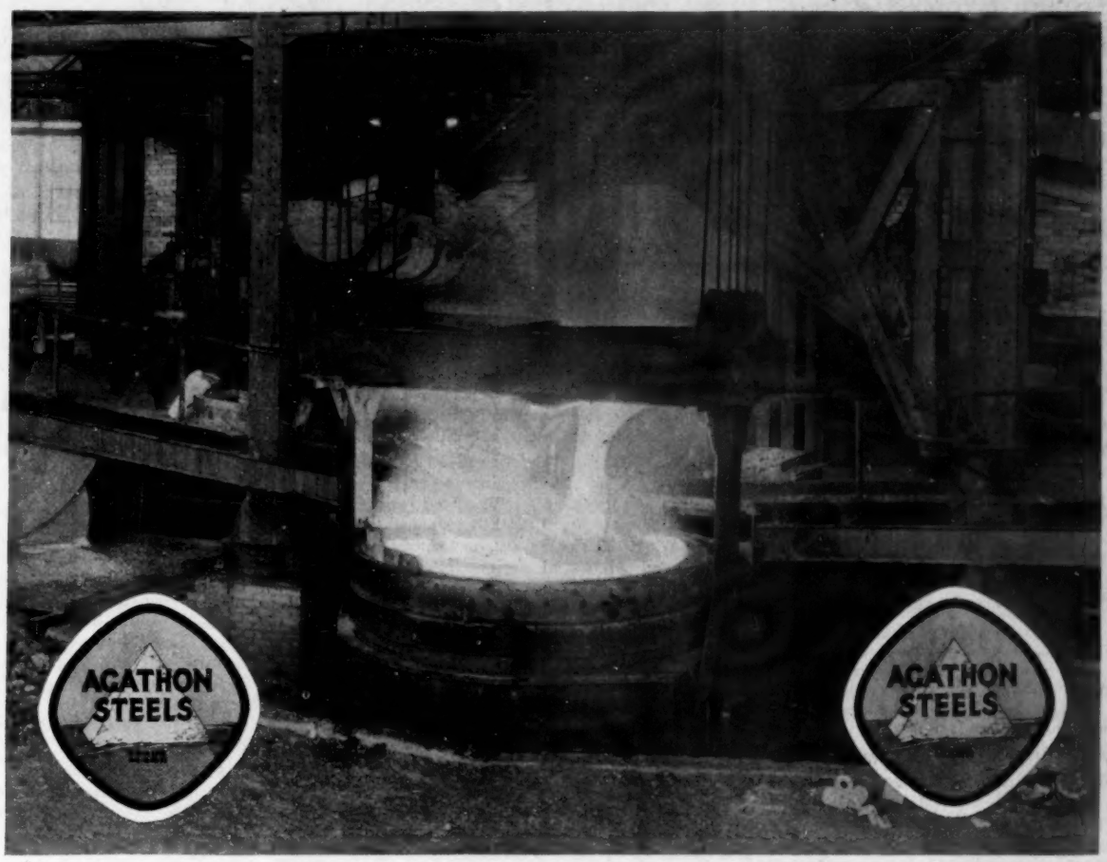

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MASSILLON, OHIO

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Cleveland Office: Hickox Bldg. - - The Hamill-Hickox Co., District Representative

1-story, 90 x 120-foot boiler house.

GENEVA, N. Y. — The Catchpole Boiler, Foundry & Machine Co. has begun work on a 1-story, 30 x 100-foot foundry building.

HORNELL, N. Y.—The DeWitt, Boag Co. shortly will let a contract for a 2-story, 50 x 80-foot manufacturing building.

LOCKPORT, N. Y.—The Fibre Corporation contemplates building a factory next spring to replace that recently damaged by fire.

LONG ISLAND CITY, L. I.—G. Sandblom, architect and engineer, 30 East Forty-second street, New York, has taken bids for a 6-story factory building, to be erected in Long Island City. The owner's name is withheld.

ROCHESTER, N. Y.—The General Railway Signal Co. has commenced work on the erection of a 1-story, 120 x 400-foot foundry addition.

ROCHESTER, N. Y.—The Danis Machine & Tool Co., Inc., recently incorporated, has taken over the plant of the W. P. Davis Machine Co. The company will enlarge its works and install some new equipment.

SYRACUSE, N. Y.—The Porter-Cable Machine Co. plant was damaged by fire.

SYRACUSE, N. Y.—The Brown Co., 213 Bellevue avenue, has begun work on a 1-story, 30 x 50 foot factory addition.

BRACKENRIDGE, PA. — The Allegheny Steel Co., Brackenridge, Pa., has leased a portion of the Baker Works, Brackenridge, which will be used as a machine shop. Some new equipment will be installed.

BUTLER, PA.—The Standard Plate Glass Co. is erecting a 158 x 200-foot brick and steel addition to its grinding and polishing shed.

CHARLEROI, PA.—The Tri-Cities Water Co. will build a new reinforced concrete settling basin at the filtration plant. Chester & Fleming, engineers, Pittsburgh, are preparing plans.

ELLWOOD CITY, PA.—W. W. Thompson is building a 2-story garage and repair shop.

FLEETWOOD, PA.—The Fleetwood Metal Body Co. has increased its common stock from $20,000 to $80,000, and its preferred stock from $5,000 to $35,000.

NEW CASTLE, PA.—New Castle Rubber Co. has increased its capital stock from $500,000 to $1,000,000. The capacity of the plant will be doubled.

NEW CASTLE, PA.—The city council has awarded Charles Staph, the contract for constructing the approaches to the Grant street bridge, subject to the approval of the county commissioners.

NEW CASTLE, PA.—The American Car & Ship Hardware Co. will build a machine shop, which will be equipped with modern machinery for the manufacture of copper, brass and aluminum products.

PHILADELPHIA.—The Tioga Machine Co. has been incorporated; $5,000 capital stock; by F. R. Hansell, G. H. B. Martin, S. C. Seymour, E. Holt Havens, Clarence M. Ayars, Holburn Ayars and W. H. Gandy, all of Philadelphia.

PITTSBURGH.—The Goodman Engine & Machine Co. has increased its capital stock from $40,000 to $65,000.

PITTSBURGH. — The Youghiogheny Coal Co., House building, will build a garage and repair shop, to cost $10,000.

PITTSBURGH.—The Pittsburgh Steel Co. is adding three 90-ton open-hearth steel furnaces to its battery at Monessen, Pa.

PITTSBURGH.—The Standard Steel Car Co. is increasing the open-hearth steel capacity of its plant at Butler, Pa., by the addition of three 75-ton furnaces.

PITTSBURGH.—The Seaman-Sleeth Co. is erecting a new office building and is increasing the capacity of its foundry for the manufacture of rolls.

PITTSBURGH.—The Carnegie Steel Co. has ordered a 1,300-ton metal mixer for the Homestead steel works from the Pennsylvania Engineering Co., New Castle, Pa.

PITTSBURGH.—John Elder, of Evensburg, has been awarded a contract for construction of the proposed $40,000 bridge over Stony creek at Horner street. This structure will be completed in about six moths.

PITTSBURGH.—The H. Koppers Co. has been incorporated to design, build and operate coke plants and plants for coke products; $10,000 capital stock; by E. M. Porter, J. A. Lager and R. T. Rossell, all of Pittsburgh.

PITTSBURGH.—The Duff Car Wheel Co., capital stock $100,000, incorporated by John T. Duff Sr., James Muir and M. E. Harrison, all of Pittsburgh. The company will manufacture a railroad car wheel with detachable rims.

PITTSBURGH.—The Independent Bridge Co., which recently purchased a site of 11 acres on Neville island, will shortly begin the erection of a new plant, which will be equipped with modern fabricating machinery. A number of electric cranes will be installed.

PITTSBURGH. — The Andrews-Bradshaw Co., capital stock $5,000, incorporated by Roger W. Andrews, 654 W. Fifth street, Erie, Pa., Grant D. Bradshaw, Johnstown, Pa., and W. E. Hirt, Erie, Pa., to manufacture electrical and mechanical devices for pumping stations.

SCRANTON, PA.—The J. N. Bastress Co. has been incorporated to carry on business as general constructor; $12,000 capital stock; by J. N. Bastress, Margaret A. Bastress, Scranton, and M. G. Hilpert, Harrisburg, Pa.

SINKING SPRING, PA.—The Krick Electric Co. has been incorporated; $5,000 capital stock; by W. F. Krick, Sinking Springs, H. S. Dissler, Denver and G. J. Root, Reamstown.

SOUTH BETHLEHEM, PA.—The Bethlehem Steel Co. is in the market for a large number of additional cranes including one having capacity of 150 tons.

WEST NEWTON, PA.—The Clark Co. has been incorporated to manufacture pipe; $25,000 capital stock; by W. E. Clark, H. W. Null and J. E. McCune, of West Newton.

YORK, PA.—The York Bridge & Construction Co. has been incorporated; $150,000 capital stock; by Henry R. Hortenstine, Charles H. Vaughan, James O. Childers, all of York.

BLOOMFIELD, N. J.—The Eastern Tool & Mfg. Co., in which Alfred G. Anderson, 74 Richmond street, Newark, N. J., is interested, has plans in progress for a 1-story, $75,000 factory to be erected here.

ELIZABETH, N. J.—The Metals Plating Co., 200 Fifth avenue, New York, has let the contract for a 1-story, $70,000 plant to be erected in Elizabeth.

JERSEY CITY, N. J.—The Durham Duplex Razor Co., 590 Montgomery street, has let the contract for a 3-story and basement, 40 x 125 x 150-foot factory, a 1-story 20 x 80-foot forge shop and a 1-story, 36 x 45-foot power plant.

LAKEHURST, N. J.—The Eddystone Munitions Co., Eddystone, Pa., has purchased approximately four square miles of land near here and current reports are that the company will erect a plant for the manufacture of ammunition.

NEWARK, N. J.—The American Piston Ring Co. has received bids on a 1-story 73 x 123-foot factory building to cost approximately $10,000 and it is expected the contract will be let shortly.

NEWARK, N. J.—A 2-story brick factory building to be used for light manufacturing is being erected at 282 South street for V. F. Davis. The structure which is irregular in dimensions will cover a ground area of 59 x 103 feet.

NEWARK, N. J.—The Beckton Chemical Co., which has several buildings in course of erection at its plant in Miller street, has let the contract for three additional 1-story, hollow tile block and steel structures, to be known as the ore leaching and concentrating buildings.

POMPTON LAKES, N. J.—H. K. Babbitt, superintendent of the cap works division of the du Pont powder plant, has announced that an addition to cost approximately $100,000, will be built at the cap works.

SPARROWS POINT, MD.—The Maryland Steel Co.'s iron ore pier was damaged by fire.

CENTRAL STATES

CINCINNATI.—A 6-story fireproof building to be used as a garage and automobile repair shop will be erected by the Graydon estate at Sixth and Sycamore streets. It will be 65 x 102 feet, and contain 40,000 square feet of floor space, and will cost $100,000. About 100 tons of re-enforcing bars and structural steel will be needed. Light equipment for a garage machine shop will be installed soon after the building is completed.

CINCINNATI.—The American Tool Works Co. has purchased the adjoining plant of the Buckeye Marble Works Co. The former company recently bought the plant of the I. & E. Greenwald Co., which also adjoins that of the American Tool Works Co. The purchasing company will have a frontage of 260 feet on Eggleston avenue, 255 feet on Pearl street, and 122 feet on Third street. New equipment will be purchased at once and installed in the new addition.

CLEVELAND. — The Cleveland Pressed Steel Co. has increased its capital stock from $10,000 to $25,000.

EAST LIVERPOOL, O. — The National Drawn Steel Co. contemplates the construction of an addition to its plant.

EAST LIVERPOOL, O. — The Pittsburgh Filter Mfg. Co. has been awarded the contract for a transmission line and recording gages for the new water works by the board of control.

KENT, O.—The Erie railroad is asking bids for a locomotive crane to handle a 2-yard bucket for coal and ashes at the storekeeping department at Kent.

SANDUSKY, O.—The Sandusky commercial club is securing estimates on a 3-mile bridge across Sandusky bay, designed to connect Sandusky and Marblehead peninsula. Officials of Ottawa county and of the Northwestern Ohio Railroad & Power Co. are interested.

STRUTHERS, O.—The Ward Nail Co. is installing nine machines and making other improvements to its plant.

TOLEDO, O.—The Doehler Die Castings Co. has purchased a factory site at Smead and Lincoln avenues and has started work on a $300,000 plant.

WAPAKONETA, O. — The plant of the Krein Mfg. Co., chain maker, has been sold to Charles F. Herbst, J. H. Goeke and A. J. Brown, who will continue the business.

YOUNGSTOWN, O. — The Mahoning & Shenango Railway Light Co. will build a new power plant. Stone & Webster, general contractors, are building the foundation for a 20,000-horsepower turbine.

YOUNGSTOWN, O.—The Youngstown Car

Co. has awarded a contract for a new office building. Contracts for new shop buildings to replace those destroyed by fire probably will be placed within the next few weeks.

CHARLESTOWN, W. VA.—Elkhorn Coal Corporation, capital stock $28,600,000, has been incorporated by Alfred Dryer, New York, Nicholas F. Lenssen, Englewood, N. J., Edward C. Kerr, New York, Louis F. Schwartz Jr., New Rochelle, N. Y. and Frank C. Titus, New York.

WHEELING, W. VA.—The United States Stamping Co. is building a 1-story, 160 x 150-foot addition to its plant.

BARBOURVILLE, KY.—T. W. Minton & Son will purchase a doweling machine, automobile spoke lathe and other equipment for a dimension shop.

CLAY, KY. — J. H. Russell and Aubry Heath are purchasing equipment for an ice plant to be erected at Rector, Ark.

CLAY, KY.—The Clay Light & Ice Co. has awarded a contract for an engine to the Ball Engine Co., Erie, Pa., and for an alternator to the Westinghouse Electric & Mfg. Co., Pittsburgh.

LEXINGTON, KY.—R. S. Webb Jr. is asking prices on an electric freight elevator.

LOUISVILLE, KY.—Bids will be received until Dec. 6, by the United States engineer for a swing bridge over the locks of the Louisville and Portland canal.

MAYSVILLE, KY.—The Maysville Cotton Mills will build a 4-story addition and considerable spinning equipment will be needed.

SPOTTSVILLE, KY.—The Caldwell Chemical Co., Evansville, Ind., is purchasing equipment for its plant at Spottsville. Coke ovens, stills, condensers, pre-heaters, etc., will be needed.

BOONVILLE, IND.—Beginning next January the Evansville, Chrisney & Eastern Railway Co. will build a 24-mile extension. J. P. Chrisney, Boonville, is president.

CHICAGO.—The Guyton & Comfer Mfg. Co. is building a foundry 50 x 150 feet.

CHICAGO.—Bids are being received for a plant for the McDonald Machine Co., manufacturer of can making machinery.

CHICAGO.—Rovtar Bros., 2230 South Wood street, are taking bids on a machine shop, two stories, 25 x 33 feet.

CHICAGO.—The Chicago Metal Refining Co. has been incorporated; $30,000 capital stock; by Samuel Goldfarb, F. Navigato and Bernard J. Brown, 155 North Clark street.

CHICAGO.—The Barry Machinery Co. has been incorporated; $10,000 capital stock; by E. A. Cudahy Jr., C. A. Barry and R. B. Webster, 226 South La Salle street.

CHICAGO.—W. O. Johnson, receiver for the Chicago & Milwaukee Electric Railway Co., 209 South La Salle street, has been empowered to contract for a bridge, costing $40,000, at Highwood, Ill.

GALESBURG, ILL.—Citizens have voted $75,000 in bonds for a water works and $20,000 in bonds for an electric light plant.

GALESBURG, ILL.—The Coulter Disc Co. will rebuild its plant recently damaged by fire.

WHEATON, ILL.—Bids will be received until Dec. 2, by the water supply commission for a 200,000-gallon tank on a 180-foot tower; two 750-gallon per minute centrifugal well pumps, 70-foot total head; 500-gallon per minute distributing pump, 200-foot head; 500-gallon per minute booster pump and a 100-horsepower unit (probably producer gas engine). L. J. Ruddock, is city engineer.

ADRIAN, MICH.—The Schwarze Electric Co. is building a machine shop, 50 x 150 feet.

DETROIT.—The Detroit Gear & Machine Co., maker of auto parts and gears, has increased its capital stock from $150,000 to $500,000.

DETROIT.—The Vanguard Mfg. Co., manufacurer of auto accessories, is in the market for presses and hammers.

DETROIT, MICH.—Dodge Bros., manufacturers of automobiles, are erecting a press and die shop, four stories.

FLINT, MICH.—The Buick Motor Co. is building a foundry 300 x 530 feet.

GRAND RAPIDS, MICH. — The Connor foundry will build a 1-story addition on Monroe avenue.

GRAND RAPIDS, MICH.—The Kent Steel & Construction Co. has been incorporated; $5,000 capital stock; by Raymond F. Smith, and others.

GRAND RAPIDS, MICH.—The Ackerman Electric Co., manufacturer of electric specialties, will build a 2-story factory on Pine street.

HOLLAND, MICH.—The Holland Furnace Co. will erect a 90 x 120-foot addition to its plant.

HOWELL, MICH. — Engine and turret lathes and milling machines will be installed by the Howell General Electric Motors Co. in the new plant for which the contract has just been awarded.

LANSING, MICH.—The Auto Wheel Co. is constructing an addition to its hub house, costing $20,000.

MONROE, MICH.—An election will be held Dec. 6 on issuing $60,000 in bonds for two steel bridges.

MONROE, MICH.—The city of Monroe wants two bridges. An election will be held Dec. 6 on a bond issue to the extent of $60,000. Both bridges will cross the Raisin river.

MUSKEGON, MICH.—The P. J. Connell Co. is building a drop forge plant at Muskegon. J. W. Hubbell is interested.

MUSKEGON, MICH.—The American Enameled Magnet Wire Co. will erect a building 100 x 380 feet.

PETOSKEY, MICH.—The Blackmer Rotary Pump Co. is building an addition.

SAGINAW, MICH.—The Michigan Engineering Co. has increased its capital stock from $50,000 to $75,000.

SPARTA, MICH.—The Welch Mfg. Co. is building a foundry.

ST. JOSEPH, MICH.—The Fay Foundry Co. has been reorganized as the Fay-Kultgen Foundry Co.; $12,000 capital stock; by M. Fay, John Kultgen and Matilda B. Fay.

YPSILANTI, MICH. — The state railroad commission has ordered a new bridge built over Michigan Central tracks at Milwaukee street and Detroit road.

HARTFORD, WIS.—L. J. Knickerbocker is building a 2-story machine shop and welding plant, 55 x 80 feet, to be occupied by the Hartford Auto Tire Pump Co.

MADISON, WIS.—Preliminary plans have been prepared for improvements at the University of Wisconsin pumping station at a cost of $20,000.

MADISON, WIS.—Approximately 500 tons of structural material will be required for the new steel girder highway bridge to be erected next spring under direction of the Wisconsin highway commission at Prairie du Sac. Plans are now being prepared by M. W. Torkelson, state bridge engineer. There will be 18 spans, 18 feet wide, with creosoted wood block paving. The requirements, in addition to the structural shapes, will be: 10,000 square feet wire mesh; 24 tons reinforcing bars; 2,000 cubic yards concrete; 300 wood piles. The bridge will cost $75,000.

MANITOWOC, WIS. — Earl F. Miller, architect, Dempsey building, is preparing plans for a 5-story brick and steel factory, 55 x 300 feet, for the Aluminum Goods Mfg. Co.

MELROSE, WIS.—Bids for the construction and equipment of a municipal waterworks system and plant for the village of Melrose will be taken until Dec. 1, by Z. V. P. Guilbert, village clerk.

MENOMINEE FALLS, WIS.—Articles of incorporation have been filed by the Lannon Light & Power Co., Lannon, town of Menomonee, Waukesha county; $15,000 capital stock; and the incorporators are William C. and Herman Lietzke and A. H. Christman.

MILWAUKEE.—A. C. Lingelbach, Milwaukee, is promoting an interurban railroad from Green Bay to Sheboygan.

MILWAUKEE.—The Crucible Steel Casting Co. is taking bids on an addition to its foundry, 40 x 90 feet.

MILWAUKEE.—The city council has appropriated $28,000 for a municipal garage, two stories, of brick and steel. P. Braman is in charge.

MILWAUKEE. — A. J. Lindemann-Hoverson Co. is building a plant at Midland and Cleveland avenues to cost $20,000. The concern manufactures stoves.

MILWAUKEE.—The F. Rosenberg Elevator Co., 170-174 Reed street, Milwaukee, has contracts for a 20-ton elevator in each of the Mumley and the Aultman-Taylor buildings, at Minneapolis.

MILWAUKEE.—The Sprinkmann interests of Milwaukee, identified with the manufacture of asbestos goods, have organized the Waterproofing Co. of America, with $20,000 capital, to manufacture and sell waterproofing compounds and goods. The incorporators are Fred Sprinkmann Jr., Arthur C. Sprinkmann and Louis Quarles.

MILWAUKEE.—The Woodwork Mfg. Co., 1222 Twenty-third avenue, Milwaukee, is about to award contracts for the erection of a new factory and mill, to be of concrete and cement block construction, three stories, 72 x 48 feet. The company will buy a limited amount of woodworking and electrical motor equipment.

MILWAUKEE.—The Sterling Motor Truck Co., West Allis, formerly the Sternberg Motor Truck Co., has increased its capital stock from $250,000 to $350,000. The new issue will be devoted to extensions to the works now under way. The company has large contracts to furnish armored trucks for foreign shipment and is making exports daily. Victor L. Brown is president.

MILWAUKEE.—The department of public works has been directed by the common council committee on bridges and railroads to prepare plans and specifications for a new bridge over Milwaukee river at North avenue, to cost $240,000. The viaduct will carry double street car tracks. Plans will be prepared both for a reinforced concrete arch bridge and a steel span structure. Fred G. Simmons is commissioner of public works.

RACINE, WIS.—The Belle City Malleable

Iron Co. is building a foundry 80 x 320 feet.

RACINE, WIS.—Damage of $6,000 was done to equipment and finished stock by fire in the plant of the Racine Iron & Wire Works. The Racine Electric Co. suffered slight damage.

REEDSVILLE, WIS. — L. E. Haellfrisch will build a 2-story garage and machine shop 40 x 80 feet.

SHEBOYGAN, WIS. — Work has been started by the Crocker Chair Co., Sheboygan, Wis., on a factory addition, to be 75 x 180 feet, four stories and basement, adjoining factory A, between buildings No. 15 and No. 1.

KEOKUK, IA.—The Keokuk Electric Metals Co. will erect a plant costing $100,000.

SOUTHERN STATES

GILMAN, ALA. — Bids will be received until Dec. 31, by the county commissioners for steel to erect nine bridges, 12 to 200-foot span. W. O. Crisman is county engineer.

SHREVEPORT, LA.—Bonds for $1,250,000 have been ordered sold for a municipal water and sewer system. The Shreveport Water Works Co. has refused to sell its plant.

DALLAS, TEX.—The Southern Railway & Boiler Works has been incorporated; $50,000 capital stock; by H. H. Orr, L. E. Burgess and H. R. Wofford.

DALLAS, TEX.—The Southern Engine & Boiler Works has been formed with capital of $5,000, by Henry H. Horr, H. R. Wofford and L. E. Burgess.

DALLAS, TEX.—The Dallas Southwestern Traction Co. has completed a survey for a line from Glenrose to Stephensville, 25 miles. E. P. Turner, Gaston building, Dallas, is president.

CLARKSVILLE, ARK. — Johnson county quorum court has ordered the construction of four steel bridges.

CHATTANOOGA, TENN. — The Andrews Paper Box Co. and the Acme Mfg. Co. will build additions to be equipped for manufacturing folding and fibre boxes and wire-bound boxes. Oliver Andrews is president of both companies.

CHATTANOOGA, TENN.—The Columbian Iron Works has been awarded a contract for the manufacture of high-explosive shells. The company has designed and is building a number of machine tools necessary. The shells are to be 4½ inches and larger. J. W. Conway is president of the company.

JELLICO, TENN.—The Davis Mfg. Co. plans to double the capacity of its plant. G. C. Davis is manager.

KINGSPORT, TENN.—The Federal Dyestuff & Chemical Co. has been organized by John C. Hebben and others, of New York, and will build a plant on a 200-acre site which has been provided.

KNOXVILLE, TENN.—The John G. Duncan Co. is in the market for a 100-horsepower boiler on skids. Second hand equipment will be considered.

TULSA, OKLA.—The Tulsa Boiler & Machinery Corporation has been incorporated; $100,000 capital stock; by J. N. Hughow, T. C. Kotter, of Tulsa, and J. E. Carnahan, of Clinton, O.

WESTERN STATES

BAYARD, NEB.—A municipal water system costing $12,000 will include a 50,000-gallon tank on a 35-foot tower, a 350-gallon per minute pump and a 35-horsepower engine. Selzer & Finley are engineers.

HARTWELL, NEB.—The Hartwell Water, Light & Power Co. has been given a 25-year franchise and will build a water and light plant at once. Charles Gilsen, Mindon, Neb., is secretary.

LINCOLN, NEB. — George E. Johnson, state bridge engineer, will let a contract soon after Jan. 1, for the Sutherland bridge over South Platte river.

BOZEMAN, MONT. — The Montana Improved Spring Wheel Co. has been incorporated and will build a plant for the manufacture of spring wheels for automobiles. James A. Johnson, Fromberg, Mont., is president and general manager.

HEDGESVILLE, MONT.—The town council is considering the installation of a water works and electric lighting system. Plans are being prepared by the Billings Engineering & Construction Co., Billings, Mont.

COLORADO SPRINGS, COLO. — The Dourte-Hassel Mfg. Co., capitalized at $500,000, G. J. Dourte, president, has been formed by combining the Hassell Iron Works and the Dourte Valveless Pumping Co.

ARCO, IDA.—R. W. Ferris has applied for a franchise to erect and operate a power and lighting plant at Arco.

HAILEY, IDA.—A franchise has been granted to County Commissioner R. W. Ferris for an electric light and power plant at Hailey.

ROCKLAND, IDA. — The public utilities commission of Boise has issued a permit to Hodges & Marsh to install a power plant at Rockland.

BELLINGHAM, WASH.—Stockholders in the Bellingham, Mount Baker & Spokane railroad contemplate the issuance of $45,000,000 in bonds for the construction of a road. J. E. Morrison is interested.

LEAVENWORTH, WASH.—It is reported that the Leavenworth steel works will start operations shortly.

NORTH YAKIMA, WASH.—Stockholders in the Selah-Moxee Canal Co. have voted in favor of replacing 3,000 feet of wooden flume with steel or concrete.

SEATTLE, WASH.—Bids will be received by the port commission of the city until Dec. 15, for installation of electrical and refrigerating equipment in the East Waterway Terminal Improvement at the port of Seattle.

SEATTLE, WASH.—The American Nitrogen Products Co. has asked the city council for the release of the city's water rights on the Sauk-Suiattle power site near Darrington. The company is reported ready to proceed at once with the manufacture of nitrogen products. E. I. Blaine and E. Jenson are interested.

SPOKANE, WASH.—Poole & Bean, Portland, Wash., have been awarded a contract for the steel construction work on the Northern Pacific grade eliminations. The contract covers six viaducts. It is estimated that 2,400 tons of structural steel will be used.

TACOMA, WASH.—The Oregon-Washington Railroad & Navigation Co. and the Oregon Short Line railroad have authorized changes in 36 miles of line in Oregon. The estimated cost of reconstruction is about $500,000.

GRANTS PASS, ORE.—W. B. Sherman has been granted a permit by the state engineer's office to appropriate 1,000-second feet of water from the Rogue river at Hell Gate for the development of an irrigation and power project to cost about $200,000. Twenty-five hundred horsepower will be produced.

PORTLAND, ORE.—J. M. Leach, conducting a machine shop at 47 Union avenue, will move to Union avenue and Yamhill street shortly and will install foundry equipment.

PORTLAND, ORE.—A 300-foot viaduct of four 75-foot steel girder spans will be erected by the Southern Pacific railroad. It is estimated that the bridge will cost about $55,000.

PORTLAND, ORE.—It is reported that the American Can Co. will build a $600,000 plant on the water front in the vicinity of the present plant. Frederick P. Kendall is district manager.

RICHMOND, CAL.—Plans are completed for a $10,000 steel viaduct at Sixteenth street over the Santa Fe tracks.

RICHMOND, CAL.—The Richmond Brass Foundry Co. has taken over the old Santa Fe Foundry, in Richmond, and will open shortly for business. New equipment is being added. John Ecklund is manager.

CANADA

CALGARY, ALTA.—The Buckeye Machine Co., Ltd., advises through its manager, that the company will be in the market after the first of the month for a certain amount of equipment. Second hand tools will be considered. The following list of machines is required: Two or three turret lathes, about 22-inch swing, having 2 or 2¼-inch spindle, to be equipped with oil pumps; three vertical 32 or 36-inch drills and four or five engine lathes ranging from 18 to 22 inches.

BELLVILLE, ONT.—The Greenleaf Co., Ltd., has been incorporated to build motors and engines, and to carry on a general business as machinist and founder; $40,000 capital stock; by Mackenzie Bowell, Henry W. Greenleaf, Charles O. Greenleaf and others, all of Toronto.

GRANTFORD, ONT. — The Maple Leaf Motors Co., Ltd., has been incorporated to manufacture motor vehicles; $750,000 capital stock; by James Harley, Edmund Sweet and Archibald M. Harley, of Brantford.

TORONTO, ONT.—The Canadian Dove-Smith Co., Ltd., has been incorporated to build machinery and tools and manufacture munitions; $40,000 capital stock; by Roderick G. Kembly, Lewis T. Rutledge, Newton H. Manning and others, all of Toronto.

TORONTO, ONT.—The R. E. T. Pringle Co. has been incorporated to manufacture articles of various natures and to carry on business as a contractor and builder; $40,000 capital stock; by Alfred R. Osborne, Robert H. Nesbitt and Robert A. Stephen, all of Toronto.

CALUMET, QUE.—The Dominion Magnesite Co., Ltd., has been incorporated; $100,000 capital stock; by Walter R. L. Shanks, Francis G. Bush and George Drennan, Montreal.

MONTREAL, QUE.—The Gunn Electric Co. has been incorporated to build electrical machinery; $20,000 capital stock; by Edward J. Gunn, William J. Shaughnessy and C. G. Howard, of Montreal.

MONTREAL, QUE.—The Regional Construction Co., Ltd., has been incorporated to carry on business as general contractor and builder; $100,000 capital stock; by Charles G. Hebert, Arthur Laberge and Eugene H. Goding.

MONTREAL, QUE.—The Dominion Copper Products Co., Ltd., has been incorporated to manufacture copper, brass and other metal products, also to build machinery and manufacture munitions; $400,000 capital stock; by Walter R. L. Shanks, Francis C. Bush and Robert C. Michael, of Montreal.

New Trade Publications

ROLLING LIFT BRIDGES.—The Scherzer Rolling Lift Bridge Co., Chicago, has issued a 40-page booklet describing and illustrating in detail the Scherzer rolling lift bridge. The booklet describes the development of this type of bridge and is illustrated with a number of views showing the bridge in service.

AIR COMPRESSORS.—The Gardner Governor Co., Quincy, Ill., has issued an 8-page bulletin descriptive of its air compressor installations with hints on the selection and operation of these machines. The booklet is illustrated with photographs of various types of single and double cylinder Gardner-Rix air compressors with steam and electric drive.

REVOLVING SHOVELS.—A bulletin has been issued by the Ball Engine Co., Erie, Pa., which illustrates and describes the mechanical features and operations of the Erie revolving shovel. The bulletin shows in detail a ¾-cubic yard machine and gives its main specifications. A method for computing the cost of operating Erie shovels is given.

RIVETING MACHINES.—The High-Speed Hammer Co., Rochester, N. Y., has published an 18-page bulletin descriptive of its riveting machines, which include hammers designed for use in connection with the manufacture of high explosive shells. A feature of the company's new hammers is the installation of heavy rubber bumpers in the rear of the machine, as well as between the hammer head and the helve, which, being made of hickory, absorbs much of the rebound. Side friction drive is used. Phosphor-bronze bushings are employed throughout. These hammers are made in four principal models, which include a number of adoptions to meet special conditions. An interesting countershaft device is also supplied, as well as motors for direct drive.

CUPOLAS.—In an exceedingly well illustrated, 32-page catalog the Northern Engineering Works, Detroit, describes the Newton cupola, which is well known to the foundry trade. Numerous installation views are given, notably those of the United States Cast Iron Pipe & Foundry Co. and the Ford Motor Co., where four cupolas of this type are installed in each shop. Ladles of various types also are shown as well as shop trucks and cars, tumbling barrels, pneumatic foundry elevators, overhead track and trolley systems, electric hoists, cranes and other equipment. A pocket size booklet also has been issued by this company which contains installation views of the various types of cranes which it manufactures and a four-page bulletin issued by this company is devoted to its electric crane trolley.

THERMIT.—An 80-page catalog, issued by the Goldschmidt Thermit Co., New York, discusses the use of thermit in mill and foundry practice. The catalog contains detailed information and directions for welding wrought iron and steel sections and numerous illustrations are included showing various classes of work repaired by the thermit process. Also, the various jobs are described in detail, which makes the catalog exceedingly valuable to those engaged in this work or contemplating thermit welding operations. The use of thermit for increasing the temperature of iron and steel, particularly in the ladle, also is discussed and the making of semi-steel in the ladle is described. A chapter on the use of thermit in foundry practice is exceedingly interesting and should prove of value to every foundryman engaged in the manufacture of iron and steel castings.

IRON SHEET PRODUCTS. — A 46-page catalog and bulletin recently published by the American Rolling Mill Co., Middletown, O., describes in an interesting manner the development of its various iron products. A feature of the publication is the historical preface, describing examples of wrought iron which have resisted centuries of wear and exposure. Among the illustrations are the famous iron pillar at Delhi, India, and the old iron chain suspension bridge at Newburyport, Mass. The methods employed in the manufacture of the company's product are also described in an entertaining manner. Among the products listed in the catalog are flumes, culverts, tanks, sash, metal lath, terne plates, corrugated iron, various types of roofing, eaves, troughs, conductor pipe, tin plate, fencing and posts, etc. Many illustrations of the company's material used in a variety of installations are shown.

ELECTRIC CONTROL APPARATUS. — Electric controlling devices for a wide variety of apparatus are described and illustrated in a recent 184-page catalog issued by the Industrial Controller Co., Milwaukee. In the preparation of this booklet attention has been given not only to the engineer who is versed in every detail of electric motor control, but also to those who possess only an elementary knowledge of electrical apparatus. As a result, the catalog contains technical details that will be of service to the engineer in solving problems relative to the control of electrical installations, and also will be found of value to the buyer who is not so well informed. The catalog is profusely illustrated. Among the devices described are direct current motor starters, speed regulators, automatic starters and automatic starting speed regulators; alternating current motor starters and speed regulators, battery charging rheostat units, field rheostats and various accessories.

BAROMETRIC CONDENSERS. — The Mesta Machine Co., Pittsburgh, has published an 8-page bulletin descriptive of its barometric condensers and dry air pumps, with illustrations showing installations made by the company in large industrial plants. The advantages claimed for the Mesta company's condensers include the elimination of the free air exhaust valve and vacuum breaker, also of all steel and wrought iron parts. These condensers consist of a cast iron head mounted upon a tail pipe and contain two cascades for the liberation of air in the circulating water, also one long water fall for condensation. At the bottom of the lower fall, openings in the water sheet are provided, in order to draw air and part of the vapor into the cascade. It is said that the thickness of the water is such that no uncondensed steam can reach the top of the condenser. The Mesta company employs automatic plate valves in the place of flash ports in its air pump.

STEEL SHEET PILING. — The Carnegie Steel Co., Pittsburgh, has issued a 98-page bulletin including tables and data on the properties and uses of steel sheet piling sections. The book, which is copiously illustrated and attractively printed, contains information on the various types of steel sheet piling and the comparative properties of steel piling and wooden sheeting. Among the topics discussed are included cofferdams, sewers and trenches, locks and navigation dams, small water power dams, irrigation dams, diaphragm dams, walls, wheels, caissons, piers and bulkheads, dock walls and steel angle piles. Methods of driving the company's steel sheet piling are described and illustrated, tables of weights and dimensions for pile driver hammers being given. Numerous diagrams are shown. Other information contained in the book includes observations on cutting, watertightness, durability, earth pressures, weights and angles of repose, pressures, safe loads for wooden and steel bracing and strength of concrete. Among additional tables are those of areas, weights and tensile strength of steel bars, strength of hoisting rope, lifting capacity of tackle, approximate drive distances, circle diameters and weights of steel sheet piling, and metric conversion tables in decimals of an inch and foot.

INDUSTRIAL CARS.—An exceedingly attractive, 152-page catalog recently has been published by the Lakewood Engineering Co., engineer and manufacturer of industrial equipment, Cleveland, describing its line of industrial cars and factory trucks. Attention is called to the fact that little consideration has been given to the proper care and construction of small steel industrial and contractors' cars and trucks. The necessity, however, of designing small light rolling stock suitable for withstanding severe usage on rough and temporary road beds, requires not only theoretical engineering ability, but practical experience and observation. Industrial cars are employed in many industries and the catalog shows a considerable number of the general types which are built. No attempt is made to enter into the details of constructing these cars, but the Lakewood company points out the necessity for each manufacturer consulting with the builder in order to determine the type of car most desirable for the service intended. The capacity of the Lakewood shops is shown by the fact that early this year an order for 30 miles of 24-inch gage portable track was shipped to France at the rate of more than one mile per day without interfering with deliveries on a large volume of domestic business. Within less than a month after the receipt of the order, the Lakewood company recently furnished eight carloads of cars and track for service in the interior of Venezuela. The catalog is profusely illustrated and handsomely printed. Among the products described are two-way dump cars, quarry cars, mine cars, skips, scale boxes, stone sleds, bin gates and cars for service in coal and ore mines, sewer tunnel work, chemical plants, steel and wire mills, cement plants, blast furnaces and automobile plants. Among the products described are side, bottom, end and all around dump cars, rack cars, removable sides, gate dump cars, scale cars, incline cars and platform cars. The factory trucks described and illustrated include a wide variety of different styles suitable for almost any class of factory service. Other products described include tracks, clam shell buckets and concrete mixers.

IRON AND STEEL PRICES

Corrected up to Tuesday noon

PIG IRON

(Delivery April 1.)

Bessemer, valley	$17.00 to 17.50
Bessemer, Pittsburgh	17.95 to 18.45
Basic, Pittsburgh	16.95
Basic, eastern Pa.	17.75 to 18.00
Malleable, Pittsburgh	16.95 to 17.45
Malleable foundry, Chicago	17.50
Malleable foundry, Philadelphia	18.25 to 18.50
Malleable foundry, Buffalo	17.50 to 18.00
No. 1X foundry, Philadelphia	18.25 to 18.50
No. 2 foundry, Pittsburgh	16.95 to 17.45
No. 2 fdy., first half, Pbgh.	15.95 to 16.45
No. 2 foundry, first half, valley	15.00 to 15.50
No. 2 foundry, Cleveland	17.30
No. 2 foundry, Ironton	16.50
No. 2 foundry, Chicago	17.50
No. 2X foundry, Philadelphia	17.75 to 18.25
No. 2X fdy., N. J. tidewater	17.75 to 18.25
No. 2X foundry, Buffalo	17.00 to 17.50
No. 2 plain, Philadelphia	17.50 to 17.75
No. 2 plain, N. J. tidewater	17.50 to 17.75
No. 2 plain, Buffalo	17.00
No. 2 southern, Birmingham	13.50 to 14.00
No. 2 southern, Cincinnati	16.40 to 16.90
No. 2 southern, Chicago	17.50 to 18.00
No. 2 southern, Phila. delivery	17.00 to 17.50
No. 2 southern, Cleveland	17.50 to 18.00
No. 2 south'n, New York docks	17.00 to 17.50
No. 2 southern Boston, docks	16.25 to 16.75
No. 2 south. interior, New Eng.	18.00 to 19.00
No. 2 southern, St. Louis	17.20 to 17.70
Virginia No. 2X furnace	15.50 to 16.00
Virginia 2X, Philadelphia	18.25 to 18.75
Virginia 2X, Jersey City	18.50 to 19.00
Virginia 2X, Boston points	18.75 to 19.25
Gray forge, eastern Pa.	16.50 to 17.00
Gray forge, Pittsburgh	16.45
Gray forge, Birmingham	10.50
Silveries, 8 per cent, Jackson, O.	23.00
Silveries, 8 per cent, Chicago	24.00 to 26.00
Standard low phos., Phila.	30.00 to 31.00
Lebanon low phos., furnace	26.00 to 28.00
Low phos., Pittsburgh	30.00 to 31.00
Charcoal, Lake Superior, Chgo., Nos. 1 to 4	18.25 to 18.75
Charcoal, Buffalo	19.00 to 20.00
Charcoal, Birmingham	21.50

IRON ORE

Lake Superior Ores.
(Lower Coke Reports.)

Old range Bessemer, 55 per cent.	$3.75
Mesabi Bessemer, 55 per cent.	3.45
Old range, non-Bess., 51½ per cent.	3.00
Mesabi non-Bessemer, 51½ per cent.	2.80

Foreign Ores.
(Per unit Philadelphia.)
(Prices nominal.)

Foreign Bess., 50 to 65 per cent.	8 to 8½
For'n non-Bess., 50 to 65 per cent.	8 to 8½

COKE

(At the ovens.)

Connellsville furnace	$2.25
Connellsville fur., first half	2.35 to 2.50
Connellsville foundry	3.00 to 3.25
Connellsville fdy. contr.	3.00 to 3.25
Wise county furnace	2.75 to 3.00
Wise county foundry	3.00 to 3.25
Pocahontas furnace	2.75 to 3.00
Pocahontas foundry	3.00 to 3.25
New River, foundry	3.25 to 3.75
New River, furnace	3.00 to 3.25

FERRO ALLOYS AND STEEL MAKING METALS

Ferro mang., delivered (prompt)	100
Ferro mang., Balti., (future)	100.00
Spiegeleisen 20 per cent, furnace	28.00
Ferro-silicon, 50 per cent, Pbgh.	83.00 to 85.00
Ferro-silicon, 50 per cent, Phila.	83.00 to 85.00

Bessemer ferro-silicon, 9 per cent to 10 per cent, $25.00; 10 to 11 per cent, $26.00; 11 to 12 per cent, $27.00; 12 to 13 per cent, $28.00 a ton at the furnace at Ashland, Jackson and New Straitsville, O.

Ferro-chrome, 4 to 6 per cent carbon, 25 cents per pound; 2 per cent carbon, 45 cents per pound, delivered.

Ferro-vanadium, $3.15 per pound of contained alloy, Pittsburgh.

Ferro-carbon titanium, 8 to 12½ cents per pound in carloads.

Nickel, 50 to 55 cents per pound.

Freight Rates via Panama Canal

Rates on finished materials, including plates, shapes, bars, wire, nails, etc., to Pacific coast points via Panama canal, per 100 lbs., in carload lots, exclusive of insurance and dockage.

From New York	$0.40
From Pittsburgh	.619
From Youngstown	.619
From Niles	.619
From Wheeling	.619
From Steubenville	.619
From Johnstown	.604
From Coatesville	.545
From Steelton	.555
From Bethlehem	.529
From Cleveland	.65
From Chicago	.765

Ferro-tungsten, nominal.
Cobalt metal, nominal, Pittsburgh.
Aluminum, 59 to 60 cents per pound, New York.
Ferro-molybdenum, Pittsburgh, nominal.

SEMI-FINISHED STEEL

Open hearth billets, Phila.	$32.00 to 34.00
Bessemer billets, Phila.	28.00
Forging billets, Phila.	40.00 to 50.00
Forging billets, Pbgh.	40.00
Forging billets, Chgo.	32.00 to 34.00
Wire rods, Pittsburgh (nom.)	37.00
Bess. bill., Youngstown	28.00
Open hearth billets, Youngstown	28.00 to 30.00
Bessemer billets, Pittsburgh	28.00
Open hearth billets, Pittsburgh	28.00
Bess. sheet bars, Youngstown	30.00
Op. h'th sheet bars, Youngstown	30.00
Bess. sheet bars, Pittsburgh	30.00
Op. h'th sh. bars, Pbgh.	30.00
Muck bar, Pittsburgh (nominal)	31.00 to 32.00

RAILS AND TRACK MATERIAL

Stand. Bess., rails, Pbgh. & Chg.	1.25c
Stand. op-h'th rails, Pbg. & Chg.	1.34c
Light rails 8 to 10 lbs., Pbgh.	1.60c
Light rails, 8 lb. Chgo.	1.49c
Light rails 12 to 14 lbs. Pbgh.	1.55c
Light rails, 12 lbs. Chgo.	1.44c

Freight Rates, Pig Iron

Mahoning and Shenango valleys to:—

Cleveland	$0.95
Newark, N. J.	2.98
Boston	3.18
Philadelphia	2.78
Pittsburgh	.95
St. Louis	3.18

Buffalo to:—

Albany, N. Y.	$1.26
New England (all rail)	2.58
New York and Brooklyn (all rail)	2.58
New York and Brookyln (by canal)	1.25 to 1.60

Virginia furnaces to:—

Boston docks (r. and w.)	$3.05
New England (all rail)	3.25
New York dock (r. and w.)	2.88

Birmingham, Ala., to:—

Cincinnati	$2.90
Chicago	4.00
Cleveland	4.00
Louisville, Ky	2.65
New York (all rail)	6.15
New York (rail and water)	4.25
Philadelphia (all rail)	5.20
Philadelphia (rail and water)	4.00
Pittsburgh	4.90
Savannah, Ga.	2.75

Chicago to:—

Des Moines	$2.80
Milwaukee	.50
Moline, Ill	1.40
Omaha	3.58
St. Louis	1.58

Ironton and Jackson, O., to:—

Chicago	$2.54
Cincinnati	1.26
Cleveland	1.62
Detroit	1.81
Indianapolis	1.58

Light rails 16 to 20 lbs., Pbgh.	1.50c
Light rails 16 to 20 lbs., Chgo.	1.39c
Light rails 25 to 45 lbs., Pbgh.	1.45c
Light rails 25 to 45 lbs., Chgo.	1.34c
Relaying rails, standard, Pbgh. & Chgo.	$23.00 to 24.00
Relaying rails, light, Chgo.	21.50 to 22.50
Angle bars, st. sect., Pbgh. base.	1.50c to 1.75c
Angle bars. st. sections, Chicago	1.50c to 1.75c
Spikes, railroad, Pbgh.	2.00c
Spikes, railroad, Chgo.	2.00c to 2.10c
Track bolts, Pbgh.	2.50c
Track bolts, Chgo.	2.50c to 2.60c
Tie plates, Chgo.	34.00 to 35.00

SHAPES, PLATES AND BARS

Structural shapes, Pbgh.	1.70c to 2.00c
Structural shapes, Chgo.	1.89c to 1.99c
Structural shapes, Philadelphia	1.859c to 1.909c
Structural shapes, New York	1.869c to 1.919c
Struc. shapes, San Francisco	2.00c to 2.05c
Tank plates, Chgo.	1.89c to 1.99c
Tank plates, Pittsburgh	1.70c to 2.00c
Tank plates, Philadelphia	1.859c to 1.959c
Tank plates, New York	1.869c to 1.969c
Bars, soft steel, Pittsburgh	1.70c to 2.00c
Bars, soft steel, Chgo.	1.89c to 1.99c
Bars, soft steel, Philadelphia	1.859c
Bars, soft steel, New York	1.869c
Hoops, carloads, Pittsburgh	1.75c
Bands, Pittsburgh	1.70c
Shafting, Pbgh., contr. carloads	53 to 55 off
Bar iron, Chgo.	1.60c
Bar iron, Philadelphia	1.759c
Bar iron, New York	1.769c
Bar iron, Cleveland	1.55c to 1.65c
Bar iron, Pittsburgh	1.70c
Hard steel bars, Chicago	1.60c
Smooth fin., mchy. steel, Chi.	1.68c

SHEETS AND TIN PLATE

No. 28, black, Pittsburgh	2.40c to 2.50c
No. 28, black, Chgo.	2.54c to 2.69c
No. 28, tin mill, black, Pbgh.	2.35c to 2.45c
No. 28, galvanized, Pbgh.	4.30c to 4.50c
No. 28, galvanized, Chgo.	4.94c
No. 10, blue anl., Pbgh.	2.10c to 2.20c
No. 10, blue annealed, Phila.	2.059c to 2.159c
Tin plate, 100 lb., coke base.	$3.60

EXTRAS FOR SHEET OR TIN MILL SPECIFICATIONS

(Per hundred pounds.)

Single pickled, cold roll, and re-anl.	30 cents
Hot roll'd pick'd and anl., tin mill.	25 cents
Full pickl'd, cold rolled and re-anl.	50 cents
Auto sheets	75 cents
Blued stove pipe stock	10 cents
Range steel	30 cents
Re-squaring	10 cents
Roller leveling	10 cents
Patent leveling and re-squaring	35 cents
Oiling sheets	10 cents
Deoxiding	10 cents
Lime finish	10 cents
Open-hearth stamping steel, free fr. mill scale	55 cents
Special open hearth deep stpg. steel free from mill scale	80 cents
Extra deep special auto body stock.	$1.25
Ext. for 28 gage ov. 32 to 36-in. wide	10 cents

No reduction for sheets not annealed.

The above extras apply on both sheet and tin mill specification, at the same rate.

IRON AND STEEL PIPE

(Pittsburgh.)

	Black. Butt-weld	Galv. Butt-weld
Steel, ¾ to 3 inches	78	63½
Iron, ¾ to 2½ inches	70	52
	Lap-weld.	
Steel, 2½ to 6 inches	77	62½

BOILER TUBES

Steel, 3½ to 4½ inches l. c. l.	69
Iron, 3½ to 4½ inches l. c. l.	57

WIRE PRODUCTS

(Retailers' price 5 cents above jobbers' quotation.)

Wire nail jobbers, Pittsburgh	$1.90
Plain wire, jobbers, Pittsburgh	1.75
Galvanized wire, jobbers, Pbgh.	2.45
Polished staples, Pbgh.	2.05
Galvanized staples, Pbgh.	2.75
Barb wire, painted, jobbers, Pbgh.	2.05
Barb wire, galv., jobbers, Pbgh.	2.75